ELECTRICAL REVIEW

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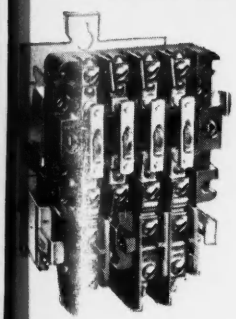

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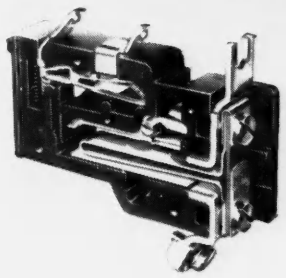

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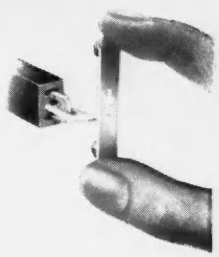

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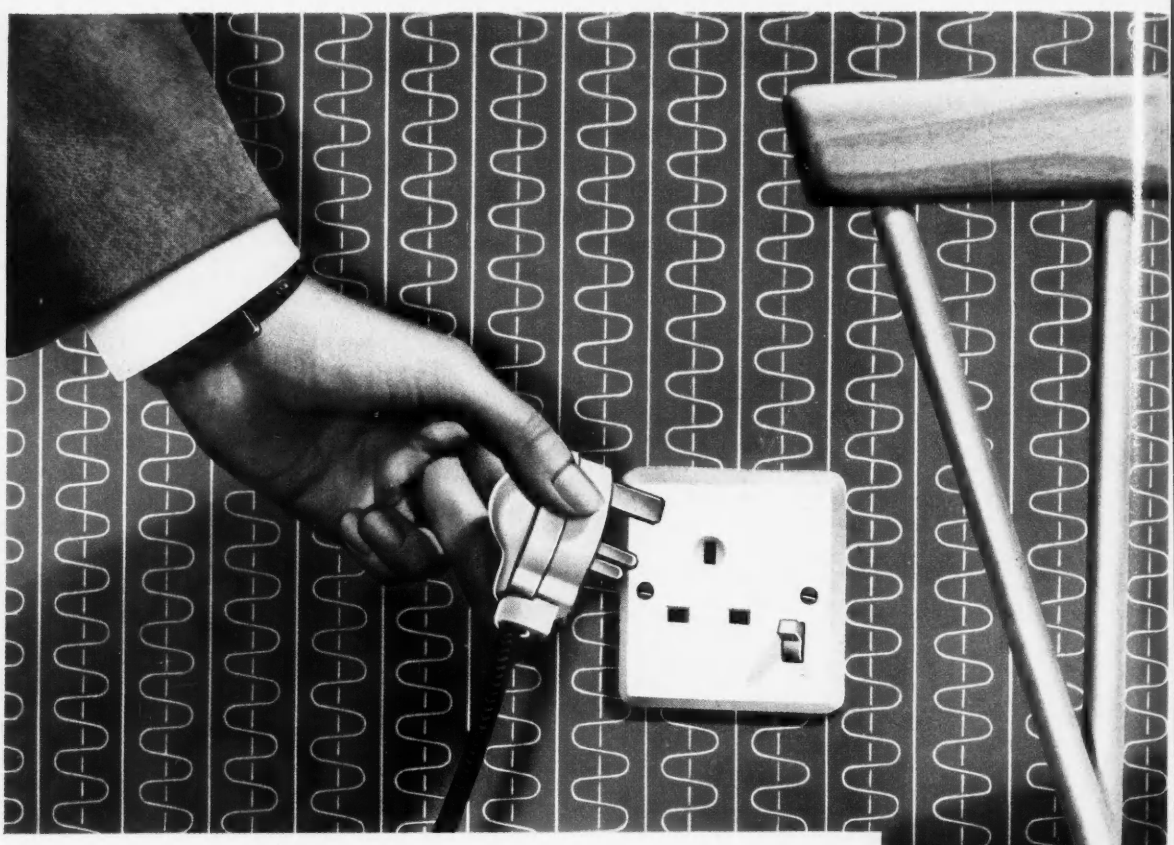

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11 MAY 1956

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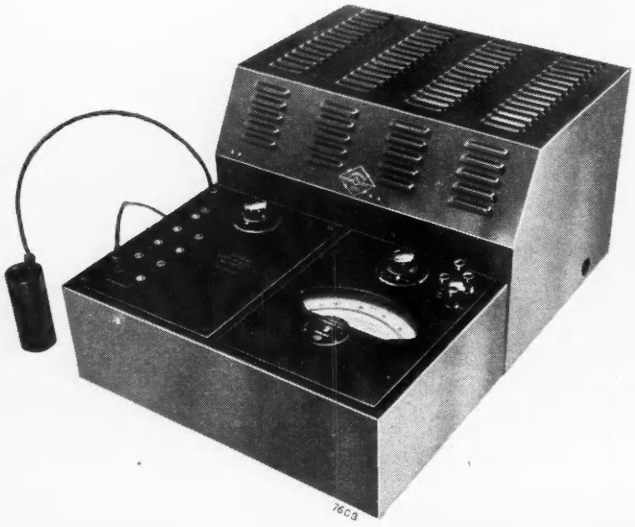

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ELECTRICAL REVIEW

11 May 1956 Vol. 158 No. 19 Established 1872

Electrical Research

SPECIAL interest attaches to the annual report of the British Electrical and Allied Industries Research Association, reviewed in our last issue, by reason of the Bill now before Parliament to reorganise the Department of Scientific and Industrial Research. The purpose of this Bill is to replace the present advisory committee by an executive council as the medium of Government contribution to the funds of the various research associations. Meanwhile the E.R.A., to give it the familiar initials, can point to a solid year's accomplishment representing an excellent return on the funds now entrusted to it. Good progress has been reported in all the major fields of electrical materials and equipment, surge and interference phenomena, heating problems and rural electrification, and in such outlying parts of the field as wind power and gas cells. Special attention is being given to safety problems and to research on materials to withstand continually higher temperatures and stresses.

The long-planned scheme for a new laboratory at Leatherhead is at last nearing fruition. Delayed first by the war and then by the change in the organisation of the supply industry it was approved in its final form in 1953 and the move from Perivale should be completed by June of this year. When this is accomplished the Association will find itself for the first time in the possession of an up-to-date research establishment built for the job and reasonably adequate for the full volume of work now in hand or envisaged.

Whether this volume is itself adequate to the real needs of the electrical industry in co-operative research may well be doubted. The tempo of the Association's work depends very largely on the rate at which the money flows in and less urgent problems have to be put aside for lack of funds. It is true that very extensive research work is done by the manufacturers to meet their particular needs but where the problem touches a wide range of interests a joint attack is likely to prove more effective and more economical. The supply industry also (since nationalisation) has supplemented its contributions by research work on its own account, but the recently published report of the Herbert Committee left no doubt of its opinion that the total volume of research work sponsored by the supply authorities is very much below the real requirements of the industry.

Hardly less important than the research work itself is to ensure that the results are fully publicised and fully utilised. The history of technology is full of discoveries which have lain idle for years through lack of appreciation. With this in mind the Association plans to supplement its regular publicity and expository activities by

periodical group discussions centred round particular aspects of recent research. Plans are being made for the second of these meetings which will deal with the applications of recent work on the detection of incipient failure of insulation.

With a new home to work in and a new Government body to negotiate with the Electrical Research Association will doubtless find that both its opportunities and its problems are greater than ever. In view of its history one can be confident that it will successfully cope with both.

NEW MAGNETIC MATERIALS

The electrical engineer has a wide diversity of magnetic materials to choose from when designing apparatus and the quality of these materials is continually being improved and the range of available characteristics extended. Among the more recently developed magnetic materials is a group of substances known as ferrites and so little has been published concerning the properties and characteristics of these important materials that they have so far only been used to a limited extent. In fact, if the average electrical engineer were asked to describe ferrites he would at best only have a hazy idea that they were magnetic materials.

Ferrite is the name given to a chemical group of material compounds which have properties characteristically different from metals on the one hand and dust cores on the other. In appearance they are like black ceramics and they possess both magnetic and insulating properties. In view of the extensive developments which have taken place in this field of activity during the last ten years the Institution of Electrical Engineers is to hold a Convention on magnetic ferrites during the autumn so that the latest developments can be reported and discussed. This Convention should be particularly useful in view of the vast number of applications for which ferrites could be used but are not due to lack of knowledge of their properties.

ELECTRIC STEEL FURNACES

We learn from a British manufacturer of arc furnaces that a large steel manufacturing concern in this country has made the bold decision to adopt electric melting furnaces for the production of ordinary grades of plain carbon steel. The initial programme provides for two furnaces each with a nominal capacity of 50 tons which will add something like 170,000 ingot tons a year to the works' output.

We believe that this represents by far the largest effort in this country to produce ordinary grades of steel by means of the electric furnace and we feel, therefore, that the development is probably the first repercussion in this country of the publication of the report of the Battelle Institute of the United States which showed that in that country the arc furnace had been used for the economic production of ordinary carbon steel for some time and recommended the wider use of this type of furnace for steel production.

While the 50 ton furnace is not a very large one compared with those in use in the U.S.A., it is a sizeable development for this country; but the really important thing is its application to the production of ordinary steels. When the Battelle Report was first published it seemed to us that the potentialities were enormous, and would have a profound influence in and on the electrical industry. We therefore published articles at the time reflecting the views on the report of the electric furnace manufacturer, the steelmaker and the electricity supply industry.

EXTENDED SERVICE

For some years the Association of Short-circuit Testing Authorities, formed in 1938 by a number of groups possessing the necessary testing facilities, has offered non-members the use of those facilities for the securing of the necessary certificates of performance. Hitherto, however, this service has been limited to 11 kV and 250 MVA and for testing at higher ratings non-members have had to look abroad. This was clearly a confession of inadequacy and was not conducive to confidence in this country's ability to do as well as others.

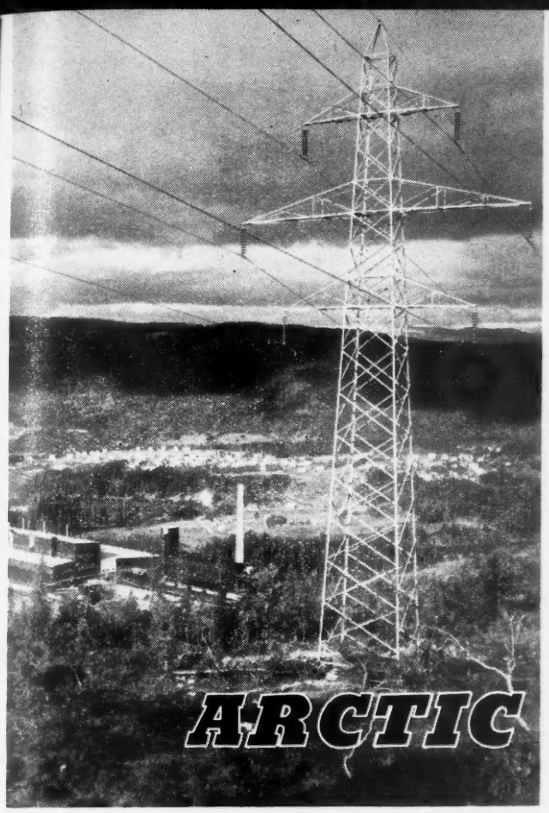
It is therefore gratifying to report (as we do on another page of this issue) that the members of A.S.T.A. have agreed to extend the range of their service to non-members up to 33 kV and 750 MVA, ratings which cover practically all gear outside the actual generating station. Testing stations are expensive to provide and run and it is greatly to the credit of A.S.T.A. that the charges for this service will be based on the normal tariff applying to members.

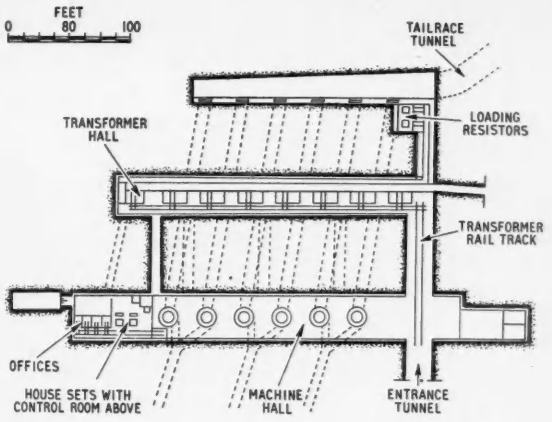
STILL DEARER COAL

The loss of £19·6 million incurred in 1955 by the National Coal Board presages an early, further, rise in the price of coal and, presumably, in due course in the cost of gas, electricity, transport and other services. As coal is indispensable it must be purchased whatever it costs but we can always hope that greater efficiency in production will prevent prices from going to fantastic heights. While it is claimed that productivity per man-shift was the highest ever recorded, actual production was down because of disputes. The better productivity was largely the result of extended power loading. It is only by increasing mechanisation (which must mean electrification to a great extent) that better results can be obtained but the benefits should not all be absorbed by claims for higher wages based on this improvement.

ELECTRICAL POWER CONVENTION

Besides full details of the programme of this year's British Electrical Power Convention (Torquay, 23rd to 29th May) next week's issue of the *Electrical Review* will contain notes on the sponsoring organisations, a preview of the Convention Exhibition, and special articles devoted to the theme of the Convention—"Electricity and Transport"





Plan of the Lower Rossaga power station

ARCTIC IRON-II

POWER FOR PRODUCTION AT MO I RANA

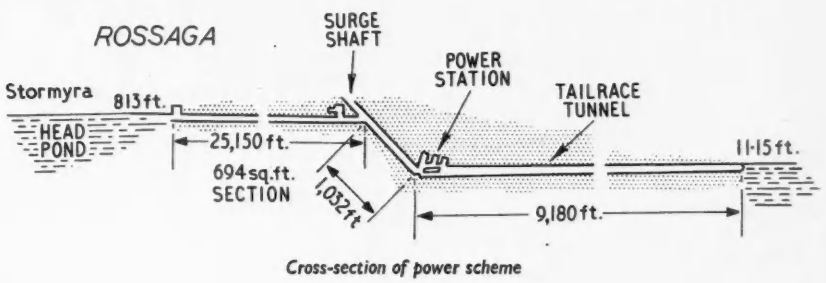
LAST week we described the Mo i Rana iron and steelworks and the high degree of electrification which had been achieved. The siting of such a large plant in this remote area, and the plans both present and future for electric pig-iron furnaces as the backbone of production, depended entirely on the availability within a reasonable distance of abundant and cheap hydro-electric power.

This was assured by the Rossaga scheme, long known on paper but of too great a size to be justified by the previous sparse population and light electrical demand of the area. Two schemes were actually available for possible development in connection with the works, the other being known as Glomfjord but this is being developed instead for supply to a nearby saltpetre works.

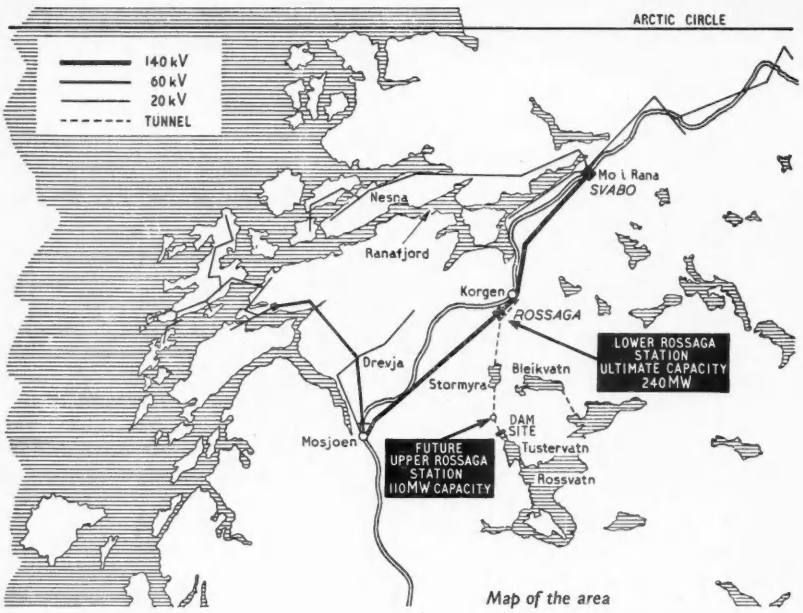
The existing demand of A/S Norsk Jernverk is for nearly 100,000 kW. In the future when there may be five further 20,000 kW iron furnaces and extensions to both steelworks and rolling mills, this figure may well rise to 200,000 kW. The Rossaga scheme, capable of supplying 240 MW from the first station and 110 MW from the second, is obviously well fitted for its task. At present only three 40 MW sets are provided but the additional three can very easily be installed when required, all necessary excavation and planning work having been done with this in mind.

The annual output from the first station when equipped with six sets is taken as 1,400 million kWh, making it a most valuable plant. The cost of the development, excluding the last three sets, will have been £9 million. The addition of the last three machines would be unlikely to increase costs beyond £11 million and, taking into account the fact that on the whole things are dearer in Norway than in this country, a cost per kW of £46 for hydro-electric plant with low running charges is very low indeed. Our own steam stations are normally in the £60-70/kW range. This fact is of course reflected in the power charges to the iron works.

The map on page 754 shows the area. Rossvatn, third in size of the Norwegian lakes, lies about 1,200ft above sea level. The Rossaga river flows from here via Tustervatn to Stormyra at 813ft. From here a tunnel runs through the mountains to the power station, which is constructed entirely underground and reached by a long access tunnel, and another tunnel carries exhausted water out to the river again, after a total useful fall of 800ft. This underground station is known as Lower Rossaga and has an ultimate capacity of 240 MW with an annual output of 1,400 million kWh per year. In the future a dam will be built at the outlet from Tustervatn and a tunnel constructed between here and Stormyra, with a second underground station to be known as Upper Rossaga, en route. The capacity of this station would be 120 MW with an annual



Cross-section of power scheme



Map of the area

output of 660 million kWh. The useful catchment is extended by the construction of the tunnel from Bleikvatn to Rossvatn, the total area being about 690 sq miles. The average flow is about 2,820 cusecs and the storage capacity available in Rossvatn and Tustervatn is equivalent to over 1,400 million kWh.

In construction the power station consists of two large caverns and one small cavern blasted out of the mountain interior. One of the large caverns is the machine and switchgear hall, the second a transformer hall and the third is purely an accessible area where the individual machine tailraces emerge into a common tunnel. The plan on the preceding page makes the arrangement clear.

Generation is by vertical Francis turbines directly coupled to 50,000 kVA alternators generating at 10.5 kV and running at 428 r.p.m. Governor drive for the turbines is obtained by a canvas belt passing round the main shaft. This and the rest of the governor gear is shown in the illustration (No. 5) on the facing page.

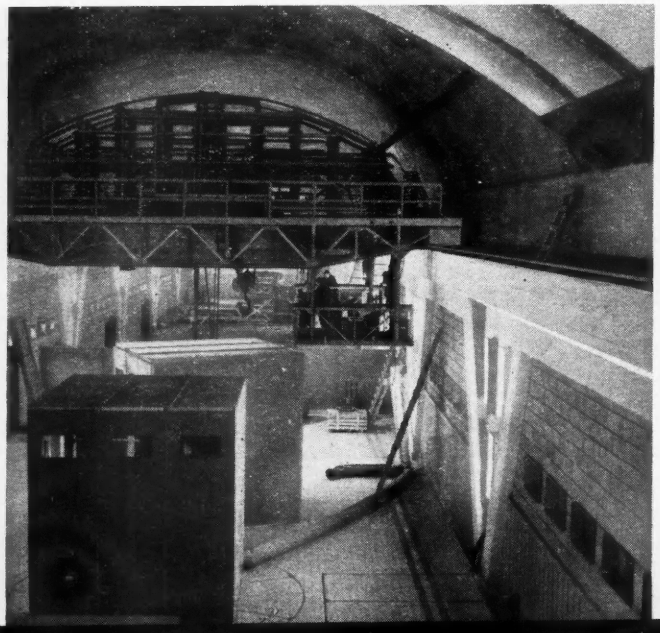
The generator output is led out on solid busbars, over the roof of the small access tunnel that runs below the main floor and along all the alternators, and into busbar corridors of wire mesh along one side of each of three tunnels leading to the 50,000 kVA transformers in the adjacent hall. Station auxiliary cabling is in another tunnel below.

The machine hall is provided with two 70-ton cranes, which are used together when supporting the full weight of the rotating parts, in the manner illustrated. When the rotor is being removed, the beam is actually positioned very much lower on the shaft, under the thrust collar and with the top of the shaft projecting well above the beam. This system minimises height requirements in the machine hall — an important cost factor in any hydro-electric station.

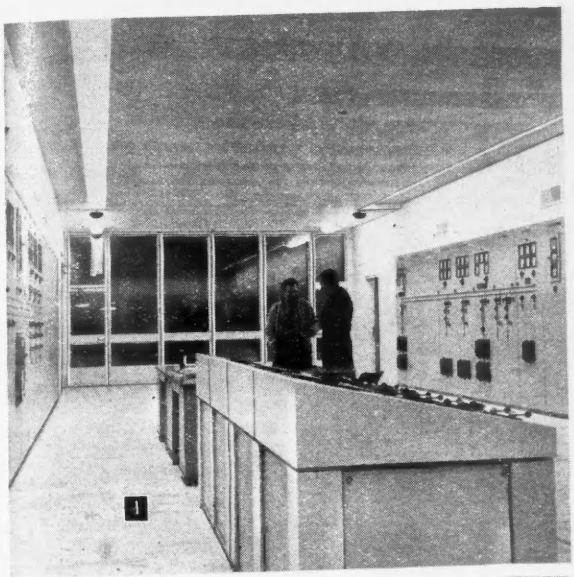
The main transformers, made by Per Kure of Norway, are 10.5/145 kV with full water cooling, and 100 per cent standby cooling capacity. The coolers themselves are separate from the transformers and of compact construction. The h.v. neutrals of the main transformers are earthed through a Petersen coil, this being common practice in Norway. The 132 kV coil in use has a rating of 146 A over two hours or 180 A over half an hour. Surge diverters are used extensively.

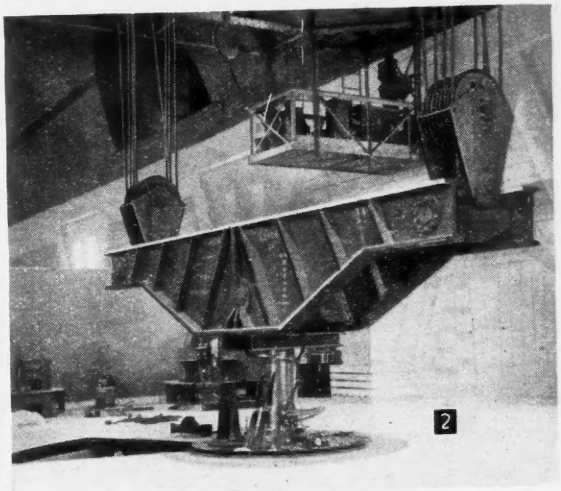
From the main transformers 500 yd long 150 kV cables of 0·15 sq in cross-section run to the outdoor 130 kV switching station, four cables being laid per set, one as a spare. The arrangement adopted for supporting these power cables in the tunnel leading to the transformers is of interest. A light steel framework similar to that used in normal cable racking carries lightweight concrete slabs running lengthwise between each steel frame and the cables lie on these slabs with additional slabs set vertically between adjacent cables to minimise fault damage.

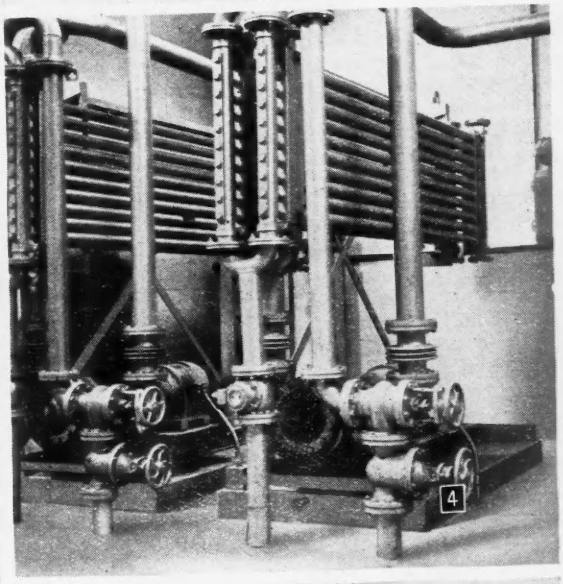
The generator hall at Rossaga. The temporary boxes over the exciters are for dust protection

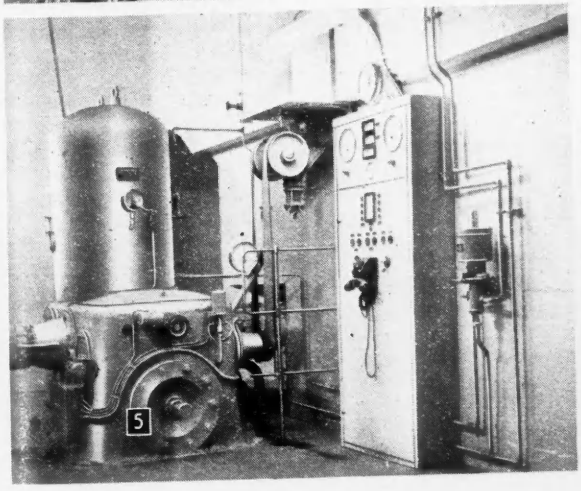


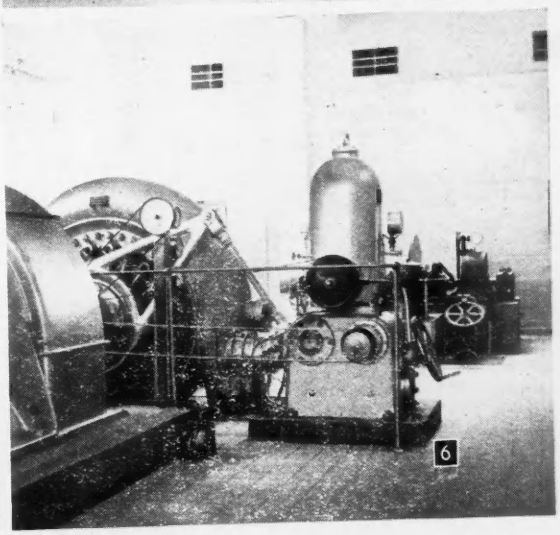
The outdoor station is unusual by British practice in having three sets of busbars. Two (A and B) fulfil the normal role as we know it here; the third set (H) are for standby use and enable a spare circuit-breaker to be brought into use immediately should there be trouble with an essential one. At Rossaga this spare breaker is in circuit with a fourth 50 MVA transformer feeding a water resistance loading bank, inside the power station, used for initial testing of the machines. It will be appreciated from the schematic diagram (p. 756) that any generator circuit can be connected by isolator either to its circuit-breaker or to the H bars which can then be used to connect with the reserve breaker and on to the busbars A or B in the normal way. The fourth 50 MVA transformer acts as a reserve in case of fault on the others, although in this case a physical interchange would be necessary. Such physical movement is rendered straightforward by having a very broad rail track down one side of the transformer cells and a similar track at right angles into each cell,





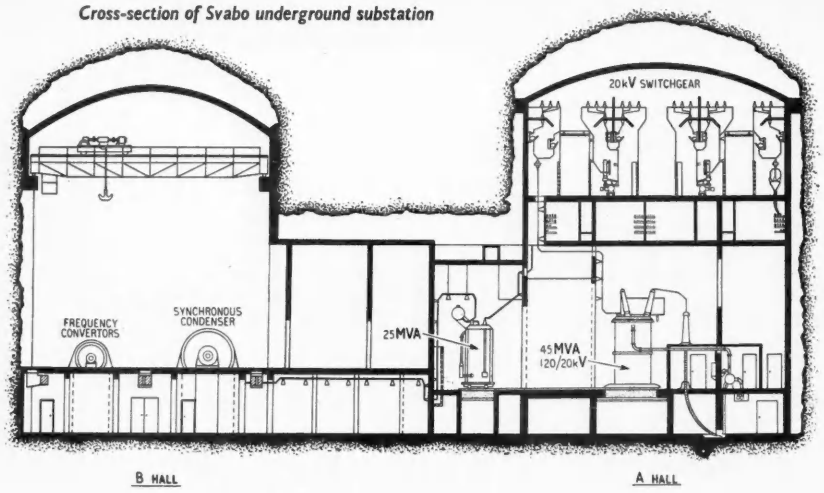






(1) *The control room—Rossaga.* (2) *Lifting beam in use.* (3) *An l.v. board at Rossaga. The same construction is used at Svabo.* (4) *Duplicate transformer coolers.* (5) *The turbine governor.* (6) *House generating set*

Cross-section of Svabo underground substation



ground station needs considerable amounts of ventilating air, the requirements at Rossaga being 3·9 million cu ft/hr for the machine hall and 3·2 million cu ft/hr for the transformer hall, provided by fans.

The machine hall is of unusual appearance, the reinforced concrete crane beams being supported by "V" shaped columns, the centre of the "V" containing three vertical fluorescent lighting fittings as can be seen in the photograph. A false ceiling is being erected under the concrete roof arch, for architectural reasons. Only the generator exciters are normally visible above the floor, and in the photograph on page 754 these are shrouded by temporary hardboard boxes maintained under a very slight air pressure to keep out dust while construction work is in progress. Field and voltage control panels are built into one wall of the hall.

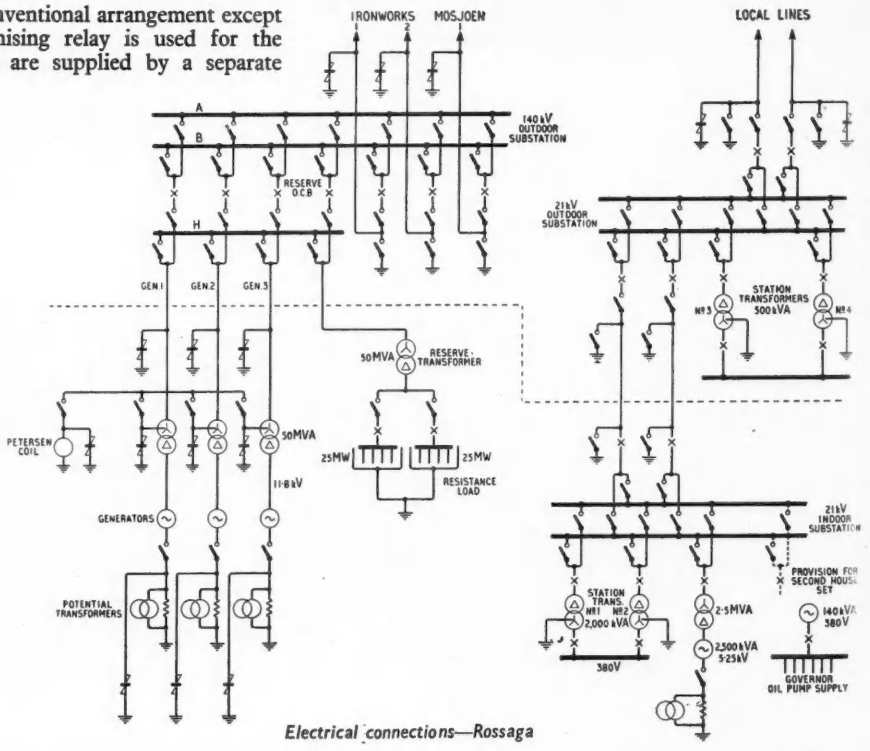
making use of the transformer wheels. A transformer is hauled out in one direction, jacked up while the wheels are turned through ninety degrees and hauled along to wherever it is required and the process repeated. These main transformers are all in fairly air-tight cells, with CO_2 protection, interlocked to prevent entry while CO_2 is "on risk." From the outdoor switching station a double line runs to the iron works at Mo i Rana and a single circuit line to Mosjoen, in the opposite direction.

To us the reserve arrangements may sound expensive but it must be remembered that all the generating capacity is meant to be used, for some time at any rate, and that there is no interconnected system in such a remote part. Failure of part of the supply might have expensive consequences at the steel plant and the possibilities of such failure have to be minimised.

The control room is of conventional arrangement except that an automatic synchronising relay is used for the machines. Station services are supplied by a separate 2,500 kVA horizontal Francis turbine. This generates at 5·25 kV which is transformed to 21 kV and supplies internal 21 kV switchgear. Provision is made for a further house set later on. Two 2,000 kVA transformers provide 380 V supplies. Two cable feeds run from this switchgear to an outdoor 21 kV substation which supplies local outdoor services, via step-down transformers, and the local area via two overhead lines. A small 140 kVA Pelton turbine and generator, in the same room as the house set, can provide 380 V supplies for governor oil pumps. All the switchgear used at 140 and 21 kV is of the air-blast air operated type and pneumatically operated isolators are universal.

The double-circuit line from Rossaga descends the mountainside behind the steelworks at Mo i Rana and feeds into the outdoor 120 kV substation illustrated. Here, too air blast operated gear is used built to Brown Boveri designs by the Norwegian firm of N.E.B.B. Surprisingly the thick snow which can build up on the circuit-breakers quite quickly causes little practical inconvenience. The tall supporting structures have concrete frames but the top members are steel—an unusual combination but one quick on erecting time.

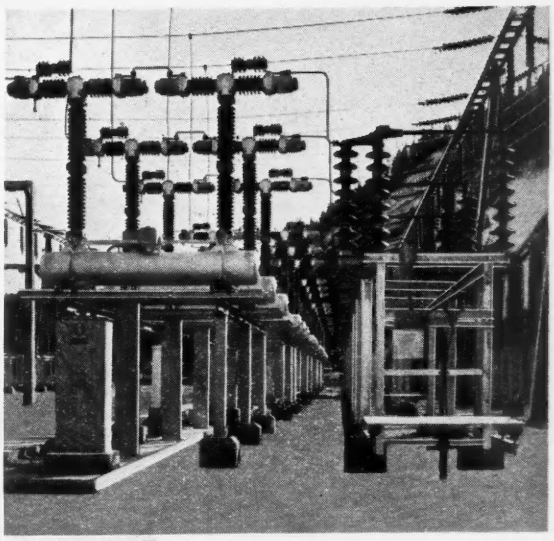
This station also has three sets of busbars on the same

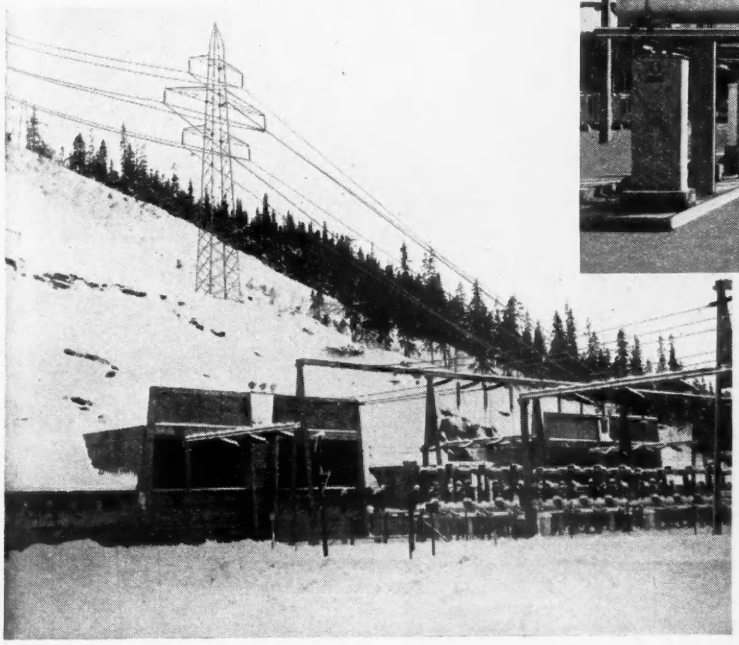


Electrical connections—Rossaga

basis as that at Rossaga, a spare breaker being provided which can be used when required in place of any other in case of trouble, via the H bar. All switchgear is of 2,500 MVA rupturing capacity as is that at Rossaga and is arranged for one-shot automatic reclosing. Oil pressure cables lead via a tunnel into the underground transformer hall where they come on to sealing ends behind the transformers.

The main transformers, of which there are three, are rated at 45,000 kVA and are 126 kV ± 5 per cent, stepping down to 23·1 kV. They are, like those at Rossaga, forced oil circulated and water cooled, and are made by the firm National Industri.





Left: The 132 kV line from Rossaga descends to Svabo outdoor substation, seen close up in the smaller picture (above)

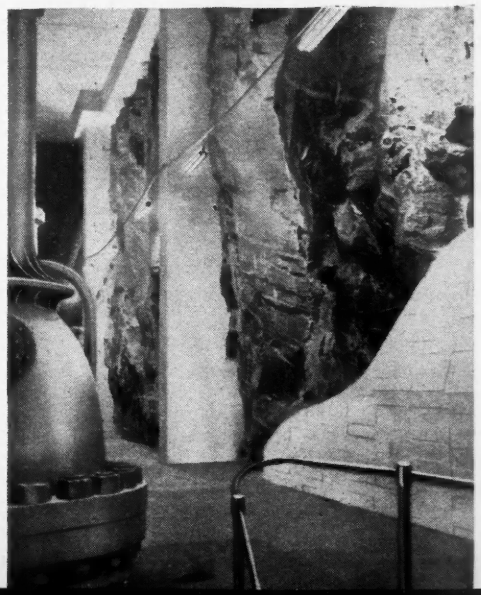
These transformers feed the main 20 kV substation above the transformer bay, as can be seen from the cross-sectional view reproduced. Cable galleries occupy an intervening space, making a neat arrangement. The 20 kV switchgear is arranged in concrete cells off long galleries, shielded from personnel by wire mesh, with bare busbars mounted on the roof. All this gear, supplied by N.E.B.B. is air blast, air operated, the extensive use of this class of equipment being mainly to minimise the fire risk. The short-circuit rating is 1,000 MVA. As can be seen from the top photograph on page 758, controls for the switches are placed adjacent to each cell, and protective relays are also located here. Remote control from the control room is the normal arrangement however.

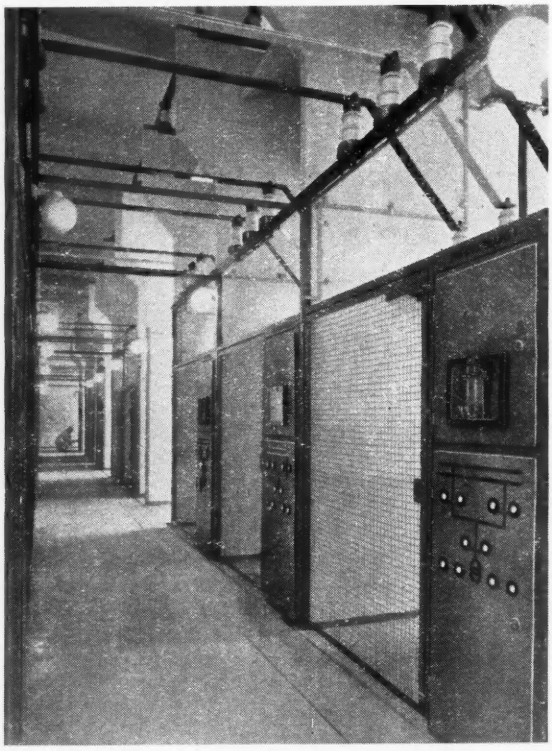
Here too three sets of busbars are used, which can be split into four sections. There is one spare breaker which can be used in place of any other via the auxiliary busbar, and one breaker for interconnecting the two main bars. Isolators are remotely operated by compressed air.

Two frequency changers and a synchronous condenser in the machinery hall of Svabo are supplied from this board. The frequency changers supply power at 15 kV 16⅔ c/s to the electric railway operated between the quayside and the works. A 15 kV switchboard at Svabo feeds out to the overhead conductors. The machines, with an intermittent rating of 1,000 kVA each and comprising a 50 c/s synchronous motor coupled to a 16⅔ c/s synchronous generator, actually operate at 3 kV, with transformation on either side down from 20 kV and up to 15 kV. Power factor regulators are fitted on the motor side and voltage regulators on the generator side. Automatic synchronising is used for parallel running and the motors have movable stators for regulating load between the two sets.

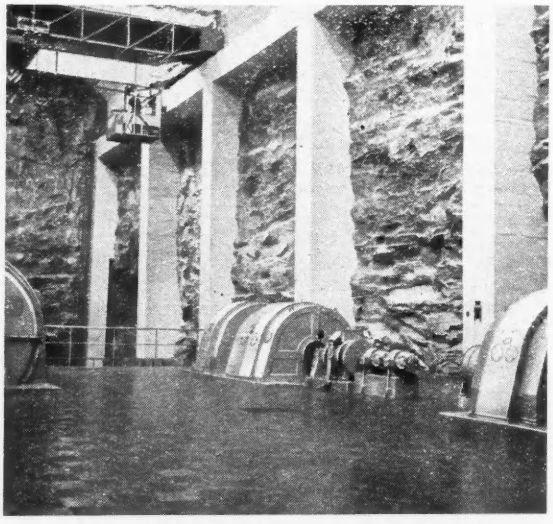
The synchronous condenser is of 25,000 kVA capacity operating at 1,000 r.p.m. and 7.5 kV. Starting is by a direct coupled three-phase slip-ring motor. Automatic synchronising is used to couple it to the main supply. The principal use of this condenser is for aiding constant voltage conditions on the 20 kV bars. The iron furnace loads are not unreasonably variable but the electric steel furnaces fluctuate violently from perhaps 2,000 to 12,000 kVA almost instantaneously on an individual furnace. The effects on the voltage are visible constantly on the

The turbine access gallery with part of an inlet valve visible





20 kV switchgear cells at Svabo



Above: Machinery hall. The two frequency changers are on the right, the synchronous condenser can just be seen to the left and (below) 20 kV cables to the works substations run in this rock tunnel

lighting system both in the works and in the town, and considerable efforts are therefore necessary to improve the regulation. The condenser also minimises the extent to which these fluctuations are felt at Rossaga.

The machine hall is a spacious room allowing scope for any possible future expansion. The natural rock walls are an effective foil to the concrete crane rail columns. An erecting bay is available at one end of the hall, which has a 100-ton overhead travelling crane. A noticeably useful point is the painting of the crane hook and block with dazzling yellow and black stripes, making them instantly and obviously visible wherever they are. The same system is used throughout the iron and steelworks for all crane hooks.

The iron and steel furnaces are fed direct from the main 20 kV switchboard, by individual three-phase supplies. For each iron furnace three cables per phase are used, of about 0·23 sq in cross section and for the steel furnaces two cables per phase of the same size.

The steel plant, iron plant and rolling mill 20 kV boards are fed from this main switchgear as is a feed to the quay. This supply has a 300 A reactor in series to limit cable sizes and fault ratings.

The control room for all the equipment is also located in the same underground excavation. It is of fairly conventional design for switchgear control and incorporates continuous recording of the load on all the electric furnaces. We have illustrated the type of construction employed at the rear of the control panels, this being perhaps unorthodox by British standards but making a most accessible arrangement.

Four stage high speed impedance relays are used for protecting the lines to Rossaga, inter-tripping between ends being by a carrier link provided mainly for communications.

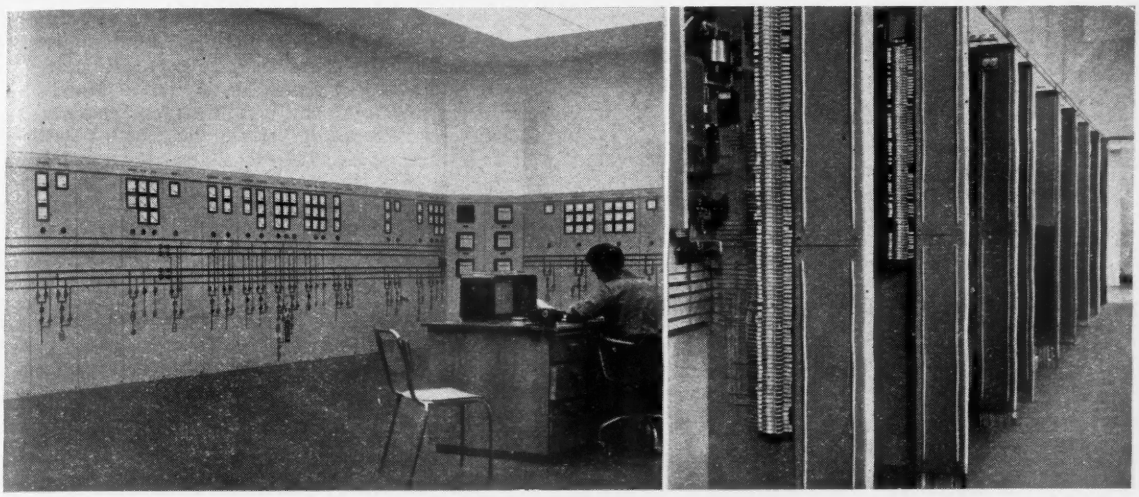
All outgoing cables from the 20 kV substation run in rock tunnels underground and are readily accessible. For internal control cabling and small services, extensive use has been made of plastic cables, which have been found extremely easy and rapid to install compared with the conventional lead covered cable.

Ventilation is important and a number of fans draw in fresh air from the outside for air renewal and for direct cooling of some equipment. This air is drawn in through a channel in the entrance tunnel and is heated to about 2 deg C during severe cold weather. Plenty of cooling water is available from the mountains and all transformers and the rotating plant have their own water coolers. The control room is air-conditioned. Acid fumes from the battery rooms are removed via a separate route.

Some trouble on the brushgear of the rotating machinery has been experienced due to the very dry air in the winter. Excessive sparking occurred but improvements have resulted from the sprinkling of water on the floor and drawing the intake air over pans of water.

The reasons for such extensive works underground were several—security, ideal conditions for maintenance and working easily procurable, away from the smoke and dust of the ironworks, and the need for a supply of rock for building work on the plant. In all some 105,000 cu yd of stone were removed. The machinery hall is 240ft long by 49ft wide by 74ft high and the transformer/switchgear hall 340ft long, 56ft wide and 80ft high.

When the Rossaga scheme was first planned it was intended that although A/S Norsk Jernverk would consume the bulk of the power, the local residents of the area should also benefit. There are in all some 59,000 people scattered in 19 communities, in the district. These are supplied by the Mid-Helgeland supply authority (MHK) who by 1955 were serving nearly 38,000 people with elec-



Left: Svabo control room, and (right) a glimpse behind the panels

tricity, compared with 23,000 to whom it was available in 1953. Some small hydro stations at Mo i Rana and at Mosjoen had been built as early as 1904 and one, Reinsfossen of 1,700 kW capacity was built in 1925 for supplying the British Dunderland Iron Ore Co., Ltd.

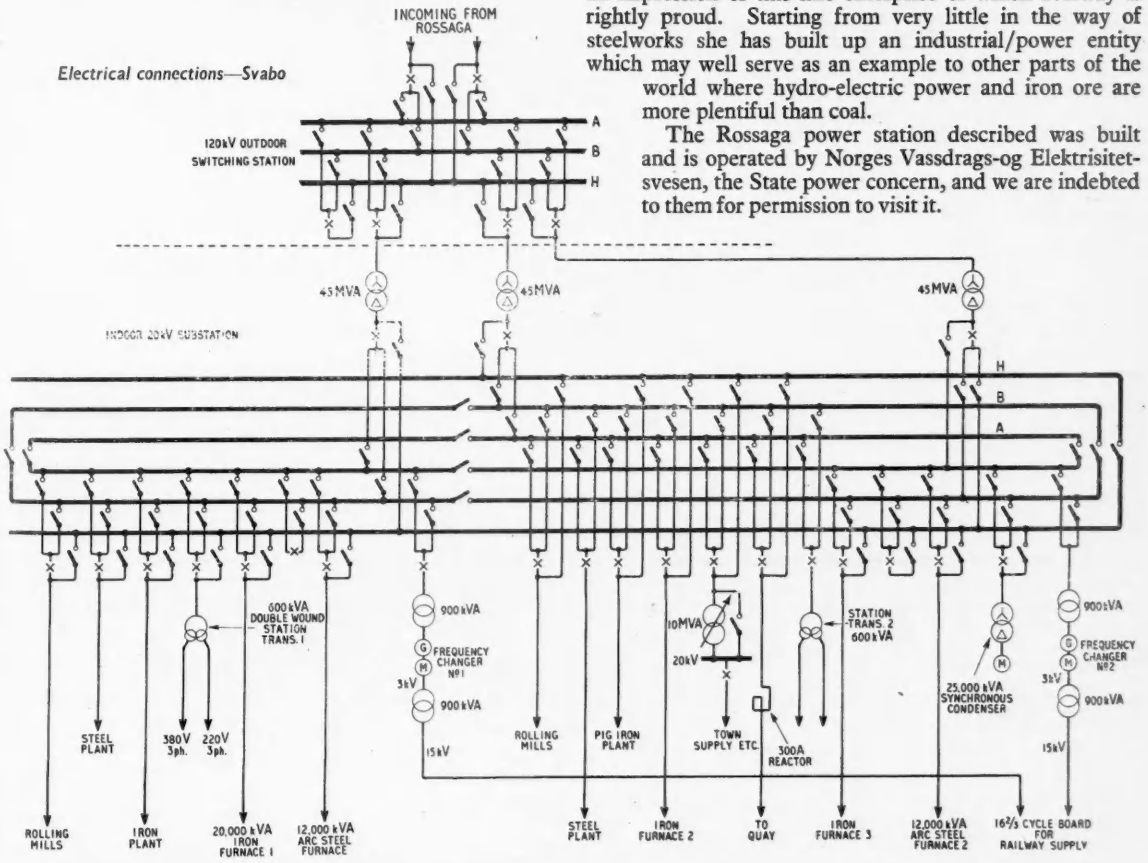
Distribution in the MHK area is at 60 and 20 kV and at Mo i Rana between 5,000 and 10,000 kW are expected to be supplied at 20 kV to MHK for supplying the district round the Rana Fjord. An overhead line is fed by cable from Svabo, the works and the MHK system being separated by a 10 MVA regulating transformer.

The chief electrical engineer of Norsk Jernverk is responsible for the operation, etc., of all the plant at Svabo, from the point where the transmission enters the 120 kV substation. He has a collection of equipment more varied than most to deal with under conditions which have yet to be fully appreciated.

We hope in this and the preceding article, to have given an impression of this fine enterprise of which Norway is rightly proud. Starting from very little in the way of steelworks she has built up an industrial/power entity which may well serve as an example to other parts of the world where hydro-electric power and iron ore are more plentiful than coal.

The Rossaga power station described was built and is operated by Norges Vassdrags-og Elektrisitetsvesen, the State power concern, and we are indebted to them for permission to visit it.

Electrical connections—Svabo



Domestic Heating

INSTITUTE OF FUEL CONFERENCE

AT the conference arranged by the Institute of Fuel and reported in the *Electrical Review* of 4th May, the Parliamentary Secretary to the Ministry of Fuel and Power, Mr. David Renton, who opened the session on fuels, described fuel efficiency and clean air as Siamese twins; the policies rose or fell together. For success it was necessary to convince the householder.

Mr. T. C. Finlayson said that all small non-coking coals should be used up for electricity generation before valuable fuel oil was considered for such purposes. Mr. T. G. Blayney agreed that as the useful employment of inferior coal was confined to electricity production, electricity should be actively encouraged for all domestic purposes, including heating. Spare plant capacity available at night could be used without further investment in generation or distribution plant, greatly enhancing the overall load factor.

Floor Heating Systems

Miss M. V. Griffith reported investigations by the Electrical Research Association into the performance of floor heating systems over two to three years for the same installation. These included large and domestic installations all using electricity during off-peak periods only. Laboratory tests with controlled ambient conditions were being run in parallel with the practical tests. She questioned the need for a 2 kW radiator in a floor-heated room. The temperature of the surface immediately below the carpet could be as much as 90 to 95 deg F. Plastic tiles neared their softening point at this temperature, but no signs of deterioration had been found over periods of about a year. A mid-day boost, hardly necessary in commercial buildings, was essential in dwellings.

Mr. T. Duerden said that a new development of p.v.c. insulated heating cable was expected to reduce the initial cost of a complete floor-warming installation to one-third or one-quarter of that of other systems. Electrical systems of this type had also additional advantages, for example, where ground floor subsidence was likely. A heating element embedded in the wallpaper could be used for local heating, particularly in existing buildings.

Mr. J. T. Scott remarked that, for fuel economy, insulation of the hot water system was almost as essential as house insulation. Post-war housing was disappointing in the standards of both. With a combined water and space heating solid-fuel appliance, an electric immersion heater for summer heating would reduce the demand for coke. Alternatively, where there was no combined appliance, the electric storage water heater could be used alone with relatively low fuel consumption.

Mr. G. L. Tomlinson urged that the electricity supply industry, both in its own interest and that of the nation, and for economic fuel utilisation, should develop the off-peak load to the fullest extent. The heating of domestic dwellings by electrical thermal storage systems, preferably by warmed floors, was economical and satisfactory. Since houses now being built would have a life of at least 60 years, by which time atomic energy in the form of electricity might well be the only considerable source of domestic heat, these houses must be adaptable. He suggested legislation requiring solid floors in place of timber. Small-bore ducts could be left in the screed to permit the drawing in of floor heating cables as and when required, with a minimum of disturbance, and the edge insulation might be incorporated in the floor as a standard.

The opening speaker in the discussion on the design and application of appliances, Mr. J. S. Hales, was critical of electric floor heating. It was, he maintained, an inflexible system, because not only was the heat supplied at night, but it was necessary to estimate what heat would be wanted next day. A good system of central heating having an efficient boiler produced heat at half the price.

Mr. W. F. B. Shaw pointed out that none of the numerous factors influencing the final selection of fuel and system was over-riding and almost all were conflicting. Cleanliness and convenience meant a great deal, but running cost was important and difficult to assess accurately. Mr. H. J. Gibson considered that the best comfort conditions were obtained by low temperature radiators and the most economical way of obtaining them was by electricity. The capital cost was less than with other methods and there were additional advantages. It used plant which would otherwise be idle and there was not enough coal to go round for all these central heating systems.

Mr. P. Draper commented that Mr. Moule had set out the clear advantage of developing off-peak loads from the point of view of the electricity undertaking, but as the reduced cost for off-peak usage was at present 75 per cent of the normal rate and was likely to show diminishing advantage, the domestic user might not be convinced of the economic advantage to himself. Economic considerations clearly ruled out the use of electricity in favour of well developed oil heating systems.

Mr. A. R. Bennett declared that the principal obstacles to progress were psychological rather than technical. One could run a normal sized gas fire or a 2 kW electric fire for an hour for the price of a cigarette, yet most people regarded these sources of heat as expensive luxuries.

Dr. S. A. Burke remarked that heating with ceiling panels was inflexible because it meant that one could not heat the room without heating that above. Heated air systems would give true controllability and flexibility. Mr. D. E. Kimber drew attention to the common practice of putting an electric fire in the fireplace without blocking the chimney. Monsieur E. Vercouter said that, as in this country, French people always preferred open fires but, at the present price of coal, open fires were a luxury which nobody could afford.

Mr. V. C. Miles, president of the American Society of Heating and Ventilating Engineers, recorded that America had 24 million centrally heated homes. Nuclear energy could only be used directly for heating in a large district heating system. Mr. L. Shepherd submitted that electricity at 1d/kWh gave 175 gallons of really hot water for a weekly cost of 5s 2d; solid fuel would cost 2s a week more.

Fuel and Fashion

Mr. J. Enoch Powell, M.P., Parliamentary Secretary to the Ministry of Housing and Local Government, opening the session on the design of dwellings, spoke of the difficulty which lay in the remote connection between fuel efficiency and the domestic user's pocket.

Miss A. D. Boyd, housing manager, Rotherham, said efficient use of fuel entailed changes in people's way of life, but habits were not static. She instanced the increased use of electrical appliances, in particular of washing machines. More money made for changes. Another factor was improvement in appliances—an electric

cooker was now easy to manage. A third was fashion; women's magazines had a considerable influence.

Mr. J. H. Madge reported that user studies by the Building Research Station showed that what mattered to the tenant was his total expenditure on fuel, including cooking and lighting as well as space heating. The Station obtained from gas and electricity suppliers and from solid fuel merchants details of the expenditure on fuel in a test year of every household included in the samples. A special study of four district heating schemes showed a cost about 50 per cent higher than in corresponding houses with normal forms of heating.

Mr. R. H. Rawll pointed out that the average annual number of fires caused by electric heaters represented only about 6 per cent of the average annual number of total fires caused by heating installations and appliances of all types. The very slight increase over 1950, when the figure was 5·86 per cent, was remarkable when compared with the growth of electricity for heating in domestic premises.

Mr. N. R. Junkinson commented that the Council flats in the Pimlico district heating scheme were apparently provided with an average of some 920 therms each in 1953 for water heating and for space heating only between 6.30 a.m. and 10.30-11.30 p.m. He asked how much of the excess over the original estimate of 535 therms could be attributed to hot water. Mr. G. J. Hughes held that an electric immersion heater prevented a waste of solid fuel in spring and summer and cut down air pollution. Miss M. R. Schofield had noted that many people would not take a tenancy where there was central heating because of the fixed weekly charge.

Dr. J. Hamaker said that in the Netherlands the consumption of all types of fuel was 0·8 ton per head per year (compared with 1·34 in Britain); yet they had larger windows and did not wear woollen underwear. They had no electric floor heating but used off-peak electricity for storage water heating. Because of the inflexibility of floor heating he regarded it as an inefficient way of using electricity.

Importance of Insulation

Mr. W. C. Moss drew attention to the collaboration of the electricity, gas and solid fuel industries on the common problem of insulation. A quarter of a million copies had been distributed of a booklet telling the householder what he could do about insulating his existing house, and another would shortly be published showing what a person could do who was having a house built. Mr. G. Vivian Davies suggested that the open fire was no longer the chief attraction in the living room—its place had been taken by the TV set.

When Dr. G. E. Foxwell summed up the conference he stressed the need for more capital investment for the efficient use of fuel and for an educational campaign. He strongly criticised purchase tax and hire purchase restrictions on electrical and gas appliances. High priority must be given in domestic heating to high thermal efficiency. Insulation could save 1 to 1½ tons of fuel per year. Remunerative capital investment should be encouraged and the cheese-paring approach to domestic heating must be abandoned.

An educational programme should be started in domestic economy classes in schools, and district advisory bureaux, staffed by experts, should be set up. Whilst the women's organisations had done a great deal, they were linked to individual fuels. Could there not be a single body and a committee to give guidance on heating for flats, he asked. In view of the need for economy of coal, the future of electricity did not lie in attempting to take a large section of the domestic load.

Mr. N. H. Bridge replied that the electrical industry had never claimed a major share in domestic heating. Adequate tests of floor heating were needed as an aid to looking a long way ahead. Cooking preferences between electricity and gas, where people had a completely free choice, were about equal.

Mr. D. R. Wills said that floor heating was perhaps the most inflexible of all heating systems. For the provision of highly comfortable background warmth operated more or less continuously there could be few better methods, perhaps, than floor warming, but in domestic premises supplementary heat was essential. Power plugs were generally provided.

Dame Vera Laughton Mathews said that the three women's fuel organisations wanted to co-operate in every way. They did so. But would it be practicable to have three or four competing industries with different consumers' organisations—and one single body?

Mr. J. W. Moule stated that the flats mentioned in his paper had been fully tenanted for nine months; during the winter each used as a weekly average 127 off-peak kWh, giving background heating, space heating and full water heating for 7s 11d. They also used in ordinary supply (including cooking) 63 kWh at 6s, making 13s 11d in all. Six local authorities had sent deputations to visit the flats. These had interviewed the tenants and had decided to install electrically heated floors in their own flats.

Coal Board's Report

Lower Output and Further Loss

LAST week we reviewed "Investing in Coal," the National Coal Board's future development programme envisaging the expenditure of £1,000 million in the next ten years. This was closely followed by the Board's report for last year which opens with the words:—"Output in 1955 was disappointing." It goes on to attribute the decline of 3·8 million tons (to 210·2 million) in mined coal to a major strike and many lesser disputes. Open-cast coal production rose by 1·1 million tons to 11·4 million.

Home demand was only met by means of "massive" imports and a reduction in exports. It was to these imports that the Board's net deficiency of £19·6 million was largely due for the loss sustained in selling imported coal at home prices was £13·6 million; actually there was an operating profit, before meeting interest and other obligations, of £15·7 million. The Board now has an accumulated deficit of £36·6 million.

An analysis of inland consumption of coal shows that while the purchases of the electricity supply industry rose by 8·2 per cent to 42·9 million tons those of the gas industry rose by only 2·3 per cent, to 27·9 million tons. The railways' consumption fell by 6·2 per cent. It is noted that the increase of 8·2 per cent in the consumption of coal by the Central Electricity Authority was accompanied by an 11·0 per cent increase in kWh sent out from its stations; thus the C.E.A. actually saved about 750,000 tons.

In a section dealing with prices it is shown that the average increase for all industrial coals was 11s a ton against 12s 8d for domestic coals.

Dealing with technical progress, the Board reports progress in the setting-up of its Central Engineering Establishment at Derby which is expected to increase the scope of development and the work done. It is expected that in 1956, the first full year of operation, £320,000 will be spent on work done at, or sponsored by, the Establishment. Most of the expenditure will be devoted to solving problems associated with the mechanisation of coal-face operations and with roof control and underground transport. It is stated that 11·1 per cent of the output last year was power-loaded, against 8·3 per cent in 1954.

Mechanising for Increased Production

EXHIBITION AND CONVENTION AT EARLS COURT

THIS year's biennial Mechanical Handling Exhibition is at Earls Court instead of at Olympia as in the past. Opened on Wednesday of this week by Sir Miles Thomas, the exhibition continues until the 19th of the month. More than 200 exhibitors are taking part. Concurrently with the exhibition an International Convention on Mechanical Handling is being held at Earls Court; there are seven sessions from 10th to 18th May with speakers from Britain, Ceylon, Switzerland, U.S.A., Canada, Australia and Germany. The exhibition and convention are organised by the Associated Iliffe journal *Mechanical Handling*.

CRANES AND HOISTS

Dominating the stands physically are the exhibits of the crane makers, many large complete cranes being on display. Herbert Morris, Ltd., have a range of their products on view and among the new items of interest are a lightweight model pulley block and an addition to the range of dual-speed electric chain hoists. Thomas Smith & Sons, Ltd., have added a new diesel locomotive crane to their range and this incorporates a number of refinements in the machinery not previously fitted in cranes of this type. It can operate a single or double line grab, is self-contained, and capable of operating for long periods with a minimum amount of attention. Its lifting capacity with a single-end rope is 5 tons at 18ft radius.

A light and economical "Monotower" crane is a new introduction by Butters Bros. & Co., Ltd. This is electrically operated, has a capacity of 3 tons and is designed for easy erection so that it can be readily transported from contract to contract. The 3 ton loading applies at 30ft radius ranging to 1 ton at 70ft radius: this latter load can be hoisted at 180 ft/min.

The main exhibit on the stand of Matterson, Ltd., is a three-motor all-electric overhead travelling crane incorporating the Matterson safety oil immersed slipper clutch transmission unit and low headroom electric hoist block. The crane is of 2 tons capacity, floor controlled and arranged to lift at 30 ft/min, to cross traverse at 60 ft/min and travel downshop at 110 ft/min. Monorail runways carrying 2, 3 and 5 ton capacity electric hoist blocks with typical collector equipment are also shown.

Three entirely new items can be seen on the stand of Steels Engineering Products, Ltd., noted for their "Coles" cranes. The first of these is the model S1210, a self-propelled diesel-electric full circle slewing mobile crane with a lifting capacity of 5 long tons at 10ft radius with a 30ft strut jib. The second is the Coles crane model L2310, the "Dreadnought," a truck-mounted full circle slewing diesel-electric mobile crane with a lifting capacity of 20 long tons at 10ft radius with 30ft centres strut jib. This crane incorporates a dynamic braking system to allow an extra margin of safety when lowering the heaviest loads through the maximum distances from the head of the longest jib. The last is the model R2310, a rail-mounted full circle slewing, one man operated, diesel-electric crane with a capacity similar to the previous one.

The largest stand in the exhibition is that of George Cohen, Sons & Co., Ltd., and is devoted to the range of "Jones" mobile cranes. Here can be seen the recently launched 3 ton capacity KL 33 crane and a new version of the KL 66, as well as the full range of better known Jones cranes. The KL 33 is powered by a 2-cylinder air-cooled Petter diesel and is offered with a wide choice of mountings, one of them being on a pneumatic tyred chassis with four wheel differential drive and four wheel steering. This is the first mobile crane to be offered with this steering arrangement as a standard alternative, the great advantage being a much reduced turning circle, in this case to a radius of 13ft.

On a somewhat smaller scale, a very useful item is the "Minilift" hoist made by the Didsbury Engineering Co., Ltd. This is a small hand operated lifting tackle which can be hooked into any static part of a building or attached to an existing crane hook for easy local control. Stanhay, Ltd., are showing a pneumatic mobile crane of 2 tons capacity with a slewing jib, requiring only 10ft headroom, and capable of carrying maximum load at the maximum reach; also shown is a hydraulic loader for tractor or lorry mounting. A 20 ton steelworks type grab and an industrial type crane and gantry with automatic control are featured by the Vaughan Crane Co., Ltd.; and the Wharton Crane & Hoist Co., Ltd., are showing a 100 ton overhead electric travelling crane which because of its size caused a certain amount of traffic disruption en route to Earls Court.

Developed in Canada to deal with severe working conditions the new "Caribou" excavator/crane of Priestman Bros., Ltd., is on display. This is already working on the St. Lawrence Seaway project and combines a high lifting duty crane with a specially built carrier chassis for movement under its own power at lorry speed. It can deal with lifts of up to 6 tons and its jib can be extended to 65ft in length. Another exhibit on this stand is the "Air-cactus" grab intended for "mucking out" in the sinking of deep coal or gold mine shafts.

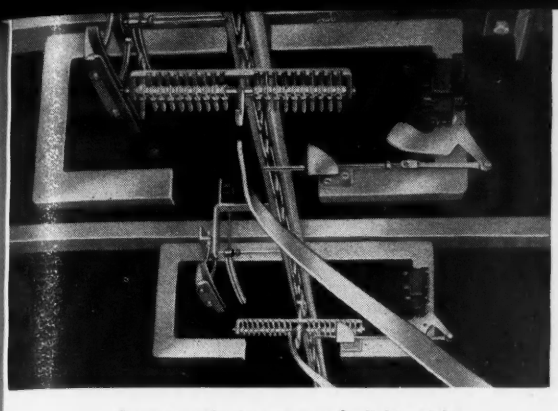
A number of accessories for use with cranes are of course on view, such as weight indicators made by the B. & A. Engineering Co., Ltd., who also show automatic grab lines and electro-magnetic cable releases and drums. A refinement of the weight indicator is an automatic safe-load indicator which gives audible and visual warning when the maximum safe working load at any radius is approached or exceeded. Wylie Safe Load Indicators, Ltd., have similar equipment on view. Another accessory is the "Templewood" spring balanced crane fork made by the Templewood Engineering Co., Ltd. This is spring balanced to hang horizontally even when empty and is invaluable for loading or unloading lorries or trucks where a fork lift truck cannot reach. Wrights Ropes, Ltd., show every type of steel rope for use with mechanical handling equipment.

Almost a crane and almost a conveyor is the "Wild" builders' elevator which enables 1,500 bricks per hour to be moved to the desired site by two men. It is mounted on wheeled bogies for transporting to new positions as required and is suitable for raising up to 30ft. The makers are M. B. Wild & Co., Ltd.

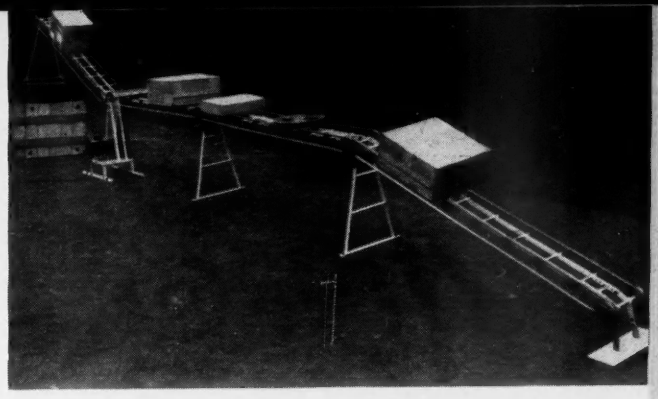
CONVEYOR EQUIPMENT

Moving on to conveyors proper, visitors to the stand of J. Collis & Sons, Ltd., can see in operation a circuit composed entirely of their conveyors which include both static and transportable arrangements. Sovex, Ltd., have an interesting new conveyor designed for handling garments, documents, or other light articles. This conveyor is preselective and discharges automatically at any station selected by the sender, the number of selections obtainable being virtually unlimited. Heavy supporting steelwork is not required and the path the conveyor occupies between stations is barely 1ft wide. Mitchell, Coleman & Co., Ltd., have a variety of conveyors of the screw type, and a blower model for conveying materials pneumatically through 9in diameter ducting. A useful portable van loader can be seen at the stand of Reynolds & Grayer, Ltd., electrically operated and plugged in to the nearest power point. Another useful product of this company is the "Zephyr" portable conveyor which can be extended to a considerable length by means of hooking sections. It will operate at a 30 deg incline and over lengths of about 80ft.

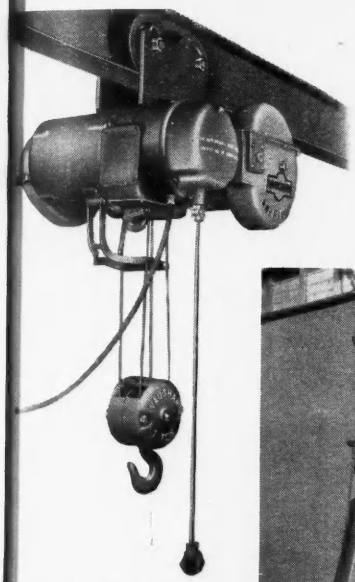
A working gravity-bucket conveyor installation is the



Sovex pre-selective conveyor for light articles

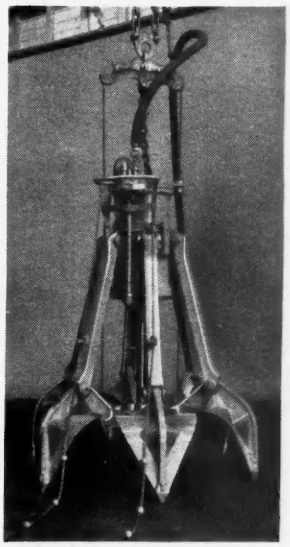


The "Zephyr," a versatile "plug-in" portable conveyor by Reynolds & Grayer

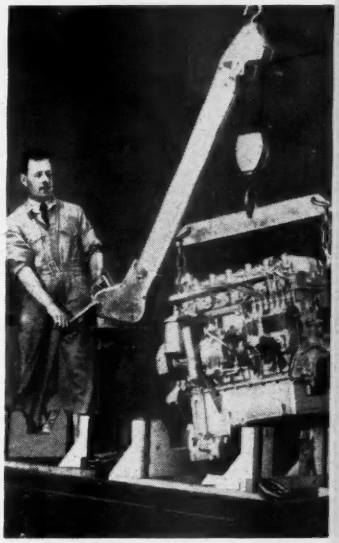


Type EB.52 one ton electric hoist block by the Vaughan Crane Company

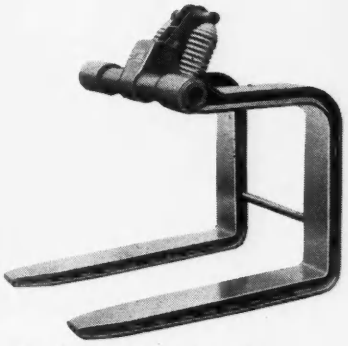
Matterson low headroom electric hoist block



Priestman "Air-cactus" grab for debris removal from shafts

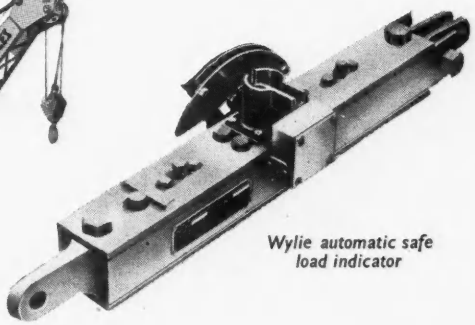


"Minilift" hoist in action (Didsbury Engineering Co.)

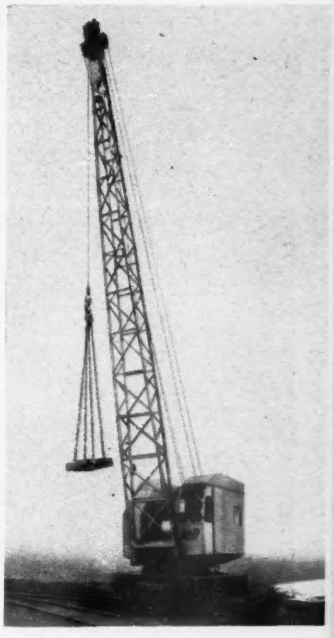


Templewood Engineering spring loaded crane fork

A self-propelled, one-man-operated mobile diesel-electric crane by Steels Engineering Products



Wylie automatic safe load indicator



Diesel locomotive crane by Thomas Smith & Sons

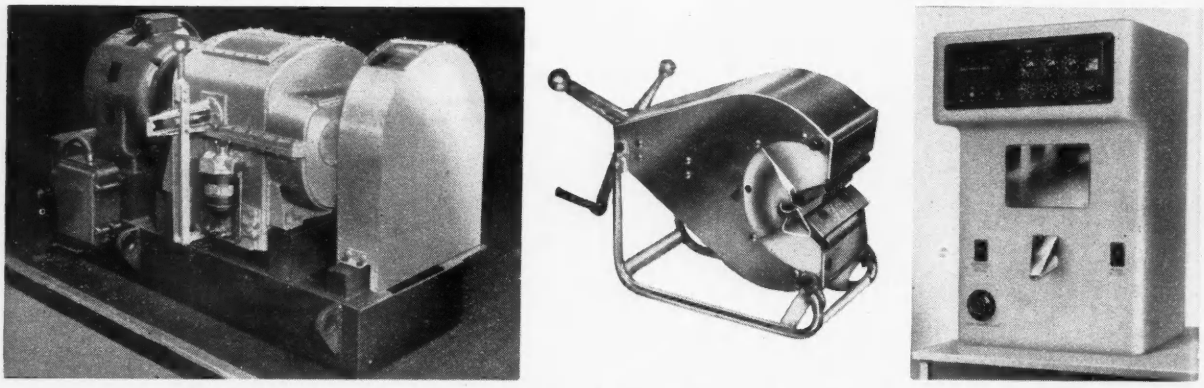
main item exhibited by International Combustion Products, Ltd. Also shown here are pumps for handling abrasive materials and a wide range of electric vibratory equipment including a bowl feeder for handling small component parts which require feeding one at a time, correctly orientated, to process machines.

Fourways (Engineers), Ltd., have their standard sturdily built portable conveyors on view and Fisher & Ludlow, Ltd., demonstrate the linking together of machines and other processes with "Fisholow" products including automatic loading and discharge equipment. A main feature of this exhibit is the "Flowmaster" index conveyor system being shown for the first time and providing facilities which permit working carriers to be moved forward, arrested, or held, the movement of one carrier being independent of another. Preselection can be incorporated to follow a predetermined path and to discharge goods automatically. In collaboration with E.M.I., Ltd., this company has produced an electronically controlled conveyor system to deliver parts in certain sequences from stores to conveyors and to the correct destination. The system uses punched tape fed into an electronic reader. Thus a programme can be prepared for a week ahead, if necessary.

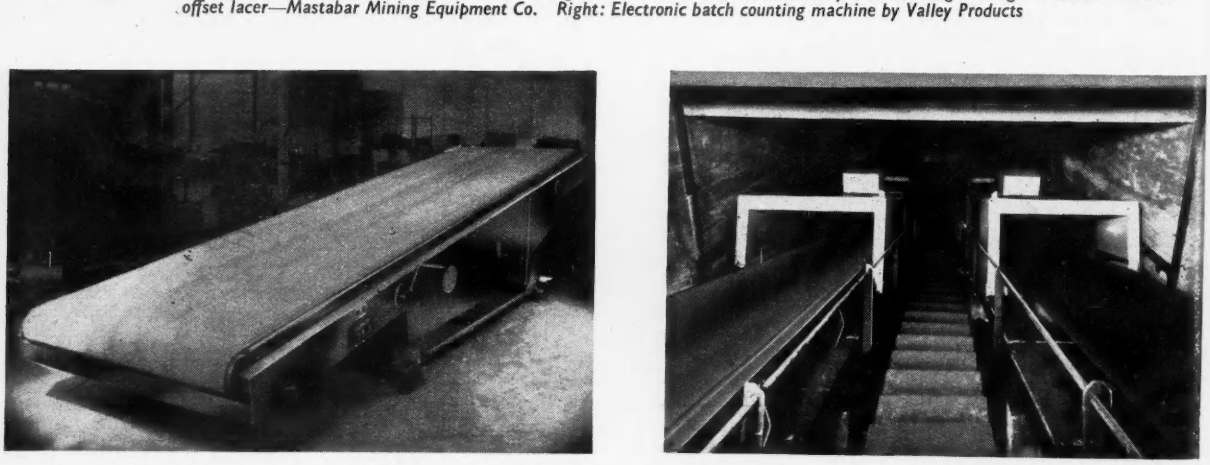
"Fourways" portable conveyor in use

The advantages to be gained by the adoption of the blanket type conveyor when the working space is limited are indicated on a full scale arrangement of conveyors working in conjunction with primary and secondary sampling on the stand of the Birtley Co., Ltd. A vibratory spiral elevator and a vibratory bowl feeder are displayed by Valley Products (Lye), Ltd., and an electronic batch counting instrument enabling any number up to 1,000 to be selected by the control dials. This is usually used in conjunction with the bowl feeder. A. L. Marshall (Carlton), Ltd., are demonstrating their new ALM "Masterveyor" unit band conveyors and elevators the unit construction of which enables erection to be carried out swiftly and extensions to be accommodated on an economical basis.

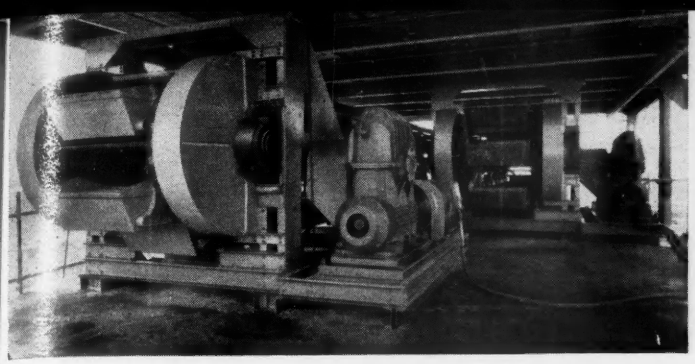
A number of accessories and adjuncts for conveyors are to be seen. The Silvertown Rubber Co., Ltd., have a representative range of conveyor beltings including those developed for handling extremely hot materials such as clinker, castings, etc., and fire resistant beltings. The Good-

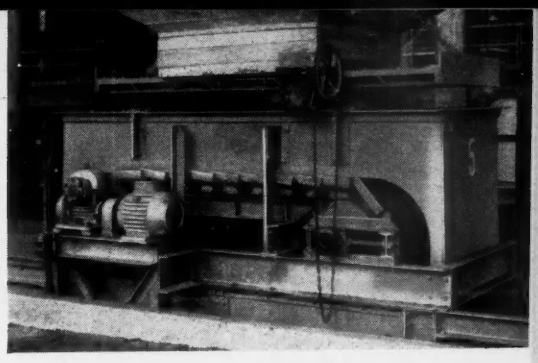


Left: Two circuit Vulcan-Sinclair fluid coupling for use in reversing drives on winches, etc., shown by Fluidrive Engineering. Centre: "Comet" offset lacer—Mastabar Mining Equipment Co. Right: Electronic batch counting machine by Valley Products



Left: Belt conveyor by the Clarke Ellard Engineering Co. Right: Metal detection equipment by Goring Kerr, Ltd., inspecting coal at a gas works



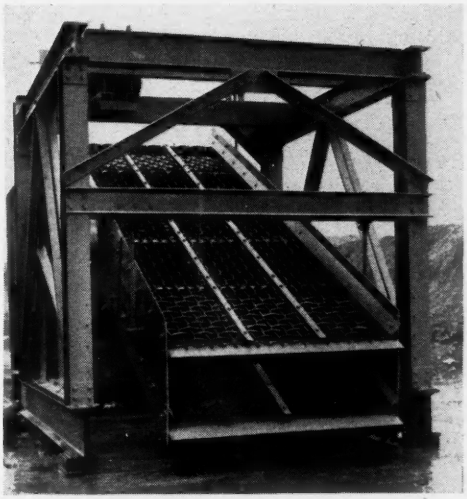


Left: Typical gravity bucket conveyor installation by International Combustion Products. Right: Plate feeder by Richard Sutcliffe, for handling up to 250 tons of coal per hour from bunker to conveyor

year Tyre & Rubber Co., Ltd., also have belting on view, and a number of products shown for the first time include rough top conveyor belting, and "Diversipipe," a special type of hose for conducting materials. Belt conveyor idlers, vibrating screens and other standard components are shown by the Moxey Conveyor & Transporter Co., Ltd., where an interesting exhibit is a working Moxey-Dillon screen similar to that installed at an ore plant.

A range of p.v.c. multi-ply fire resistant conveyor belts is on view at the stand of Rubber Improvement, Ltd. These belts were originally developed for the coal mining industry and by incorporating new types of base fabrics such as high tenacity rayon, considerable improvements in belt weights and flexibility have been achieved; an anti-static belting is also to be seen.

A number of metal detectors for use in conjunction with conveyors is on display. One by Electroma (Industrial Equipment), Ltd., offers completely automatic inspection for the detection of ferrous or non-ferrous metal in any non-metallic material. These are now being used in a wide field of industry from food to textiles; an electronic check weigher is also to be seen on this stand. Tubewrights, Ltd., who are specialists in the design and manufacture of tubular steel structures, show a representative range of their products including collapsible crates, trolleys, cargo trays, etc. Belt fasteners, lacing machines, cutters, etc., and a range of fasteners for p.v.c. belting are shown by Mastabar Mining Equipment Co., Ltd., including a new off-set "Comet" lacer. This is a little changed from the all-steel lacer introduced last year, the cone having been redesigned. Mavor & Coulson, Ltd., exhibit idlers which they claim reduce the friction and increase the reliability of belt conveyors. Also shown are cushion idlers for saving wear on the belt where the load is fed on to it. Rubery Owen & Co., Ltd., have a range of work pans for handling small components and for conveyor transit amongst other items.



Moxey-Dillon screen

Nortons-Tividale wagon control equipment

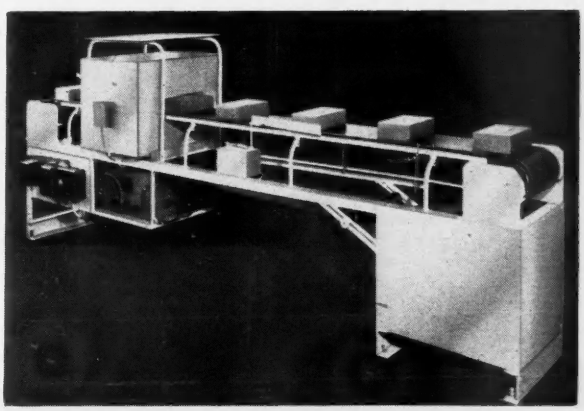
INDUSTRIAL TRUCKS

A notable feature of the exhibition is the very large number of manufacturers who show trucks for the movement of materials. This is, of course, only to be expected when the subject of mechanical handling is considered, and the range of different types available would certainly seem sufficient to satisfy any requirement possible. Hand operated, diesel driven, petrol-engine driven and battery operated trucks are shown for a wide variety of specialist as well as general purpose duties.

H. C. Slingsby, Ltd., have a wide selection from their comprehensive range, mainly of hand operated trucks, but a prominent feature is their skates for moving heavy equipment with a capacity range of from 10 cwt to 100 tons. A new item being exhibited by this company is a truck which can be hand operated or powered at will. The release of the hand control disengages the power drive, leaving the operator with a free running hand truck. Geest Industries, Ltd., also show a wide range of hand and motor driven trucks and pallets.

A completely new attachment designed to permit unit load handling without resorting to any form of pallet is the "Load Clamp" developed by Conveyancer Fork Trucks, Ltd. The clamp is hydraulically actuated and incorporates

Below: Electroma metal detector mounted on its own conveyor



a pressure control valve to eliminate damage to loads. The latest industrial product of Ransomes, Sims & Jefferies, Ltd., is the ITW industrial tractor, an adaption of their MG crawler tractor. This is a lightweight machine combining the advantages of a truck, tractor and a wheeled vehicle. A low centre of gravity and a balanced weight give it great stability and manœuvrability and it has proved an ideal machine for shunting railway trucks. Mathew Bros., Ltd., are demonstrating for the first time their 8,000 lb fork lift truck which with a Fordson Major engine has a load of this capacity at 24in load centre. The load is lifted by twin hydraulic cylinders, steel wire ropes and a roller mounted fork carriage and with a 6in ground clearance under the mast and 9in under the body, rough ground can be covered without trouble. Among the items shown by Ransomes & Rapier, Ltd., is their super-fork truck which follows the general pattern of an ordinary fork truck but has the mast arranged to swivel to one side, thus enabling the load to be carried end-on in line with the direction of travel of the truck, and is particularly useful for handling long loads such as timber, steel sections and pipes; this is an entirely new machine.

The Yale & Towne Manufacturing Co. occupy two stands at the exhibition, one arranged to display the large range of Yale electric industrial trucks available in capacities from 1,500 to 8,000 lb and the other featuring a new hydraulic hand-lift truck made in capacities of 4,000 and 6,000 lb. An addition to their range of electric trucks is the platform "Warehouser," a two-ton capacity low lift truck having only 30¾in "lost length" and designed to move loads at high speed in congested factories.

Among items from the "Stacatruc" range of ITD, Ltd., shown for the first time, are a battery electric model fitted with a rotating paper roll clamp which can handle and carry paper rolls at any desired angle and stack them vertically. A hand truck for carrying paper reels and oil drums and incorporating a standard hydraulic unit is that of Omic, Ltd. Examples of pedestrian controlled electric trucks are displayed by Diamond Motors (Wolverhampton), Ltd. Among new items are a pallet truck model with a very compact power unit and 1 ton capacity, and a low stillage model with the same power unit.

An ingenious side-operating fork-lift carrier is shown for the first time by Materials Handling Equipment (Great Britain), Ltd. This truck, the "Irion," has been primarily designed for the stacking and unstacking, etc., of loads up to 50ft in length and 3 tons in weight, and the load is carried longitudinally and equally placed on decks over all four wheels instead of transversely and on the forks in front. The load is picked up on a fork-lift unit in the usual way, this then retracting and lowering so that the load is distributed over the length of the vehicle, in which the fork unit is centrally placed. A compact 10 cwt fork truck arranged for up to 10ft lift and designed to operate in narrow passageways is the latest product displayed by Wingrove & Rogers, Ltd.

Brush Coachwork, Ltd., show a representative selection of their Brush battery electric industrial trucks and tractors ranging up to a size for pulling loads of 6 tons and a high load platform truck with a capacity of 2 tons. For the first time there will be on show their flameproof truck designed to BS 229/1946 for use in hazardous atmospheres and a new palleting transporter designed to take standard pallets over comparatively long distances and over uneven ground.

R. A. Lister & Co., Ltd., have an entirely new diesel powered truck known as the platform model LD auto-truck. This is highly manœuvrable and is driven by the well known 3½ h.p. Lister air-cooled diesel engine. The maximum load is 2,000 lb and the platform has a loading area of 17½ sq ft. Electric fork trucks are shown by Wessex Industries (Poole), Ltd. A new item is an electric tractor of small overall size designed to haul a train of industrial trailers with a 10-12 ton load.

Another maker of fork lift trucks and other mechanical handling equipment is R. H. Corbett & Co., Ltd. An interesting exhibit on this stand is an end-loading drum rack developed in conjunction with one of the large oil companies and including a self-loading drum gate. The rack is designed to minimise waste space in storage areas and the idea is to load drums at one end so that they roll down runways to the end of a set of rails, thus enabling many drums to be stored on one set of rails. The entire load could not be permitted to push against the end barrel hence the special end compartment which loads itself automatically with one drum at a time and from which a fork lift truck can readily remove the drum when required, without the driver dismounting.

The principal exhibit on the stand of the Industrial Machine & Equipment Co. (Brimpex), Ltd., is a telescopic automatic lifter which is available either in an electric or a petrol-driven model. It is designed for rapid and safe load lifting and is capable of lifting 60 tons/hr and approximately half this amount when set to lift double the height. The machines are automatic once in position and started, as the load itself operates the machine. Sacks, cases, casks, parcels, etc., lift themselves to a previously adjusted height at the rate of 8-10 lifts per minute.

A comprehensive range of boxes, stillages and pallets is shown by Eccles (Birmingham), Ltd.; and the Paterson Hughes Engineering Co., Ltd., devote most of their space to the "Palletizer" which they market jointly with Lansing Bagnall, Ltd. This provides the link between the conveyor system and a palletised storage and transport system by automatically building up loads of cartons, boxes, etc., on the pallets.

In a related field a number of manufacturers are showing power operated shovels of one sort and another including Power Handling, Ltd., the Chaseside Engineering Co., Ltd., and Mackay Industrial Equipment, Ltd. The Ford Motor Co., Ltd., show the way in which the Fordson Major diesel tractor is modified when fitted with rear loaders, shovel attachments and stacking platforms.

Most of the electric powered trucks on view depend upon batteries as their source of energy and a number of battery makers are represented at the exhibition. One of these is the Tudor Accumulator Co., Ltd., who have on view a number of cut-away cells to enable visitors to see the make-up of each component. This company manufacture a complete range of cells for all types of battery driven industrial trucks, tractors and locomotives, and their batteries to-day include triple separators consisting of felted glass wool pads against the positive plates, treated wood sheets against the negative plates and a "Porvic" micro-porous plastic diaphragm to form a barrier between the two.

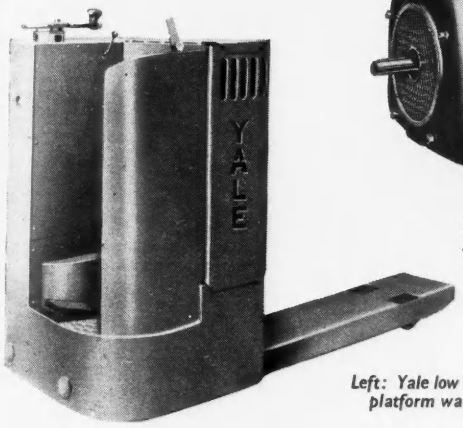
Another exhibitor is the D. P. Battery Co., Ltd., whose main feature is the "Kathanode" cell designed specifically for all types of battery operated mechanical handling equipment. This utilises "Porvic" ribbed separators, improved grid alloys and special insulating rods filling the spaces between separators at the edges between each negative plate. Nife Batteries, Ltd., have as the focal point of their stand a display of the component parts of their nickel cadmium alkaline battery showing the special features. The display is completed by specimen cells from the new Nife DL range which have excellent high rate discharge characteristics and are therefore particularly suitable for starting internal combustion engines in heavy duty fork-lift trucks.

ELECTRICAL EXHIBITORS

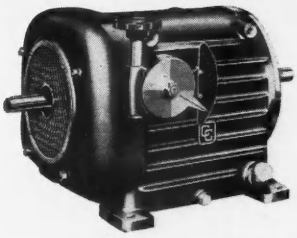
A number of well-known electrical manufacturers are represented including the Metropolitan-Vickers Electrical Co., Ltd., who have only one exhibit on display, the main purpose of the stand being to provide facilities for discussion of particular requirements with the company's engineers. The lone exhibit is a working model of a 9,000 h.p. geared Ward-Leonard Ilgner winder of a type being supplied to the National Coal Board.

British Insulated Callender's Cables, Ltd., show a comprehensive selection of current-collection equipment for cranes, conveyors and electric haulage applications. On view for the first time is this company's newly developed, fully guarded, conductor current-collection system for use with cranes and conveyors. Emphasis is given to their range of flameproof motors by Newman Industries, Ltd., and exhibits range from ⅙ h.p. "Elf" motors to 120 h.p. slip-ring motors. Their flameproof motors are available with steel barrel

Left: Conveyancer "Overlander," a fork truck for operation on rough ground. Right: "Steelmaster" tractor by the British Straddle Carrier Co. Ltd., fitted with a 30 cwt crane



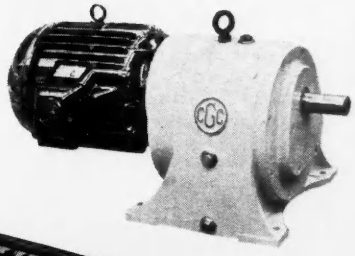
Left: Yale low lift electric platform warehouser

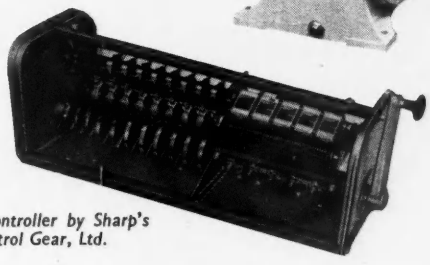


Infinitely variable speed gear by Carter Gears, Ltd.

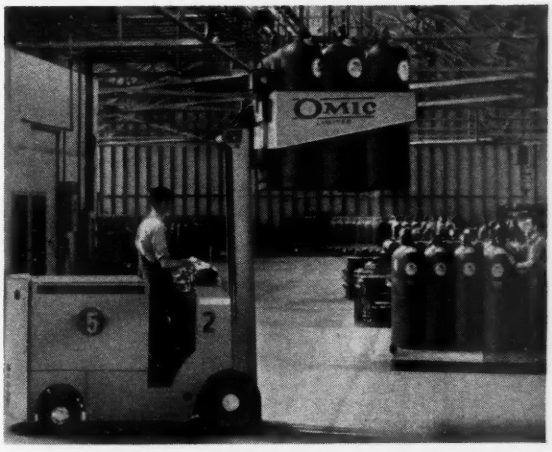
Diamond Motors "Graisely" ride-on electric truck

Right: Size 4 "Coventry" geared motor shown by David Brown Industries



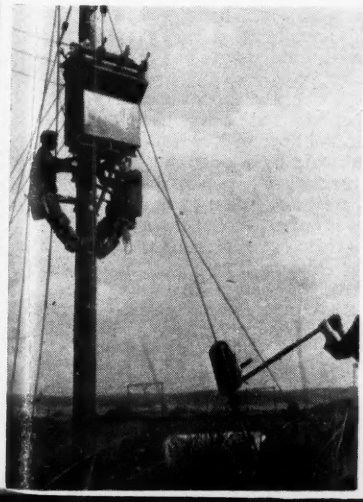


Crane controller by Sharp's Control Gear, Ltd.



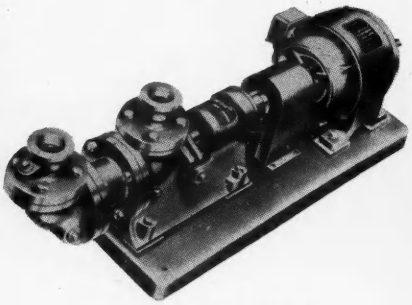
Multiple drum carrier by Omic, Ltd., in use on a fork-lift truck

Below: Tirfor machine in use on overhead line construction

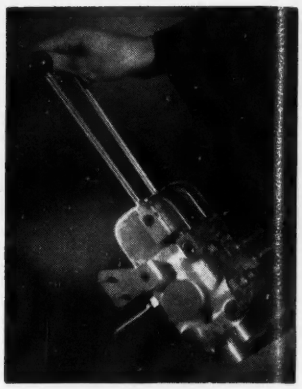


Eccles "long-load" lift truck in use

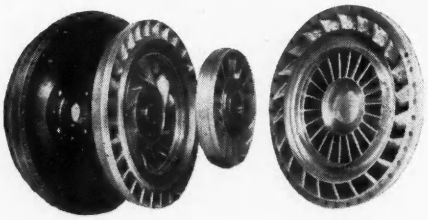
Tote bulk handling container



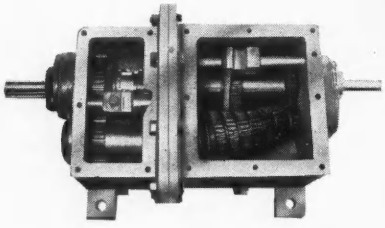
Overhead view of a D4 Monopump



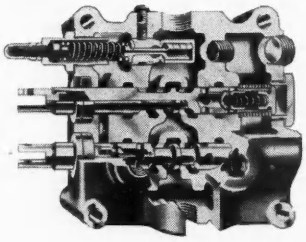
Manually operated pilot valves by Smiths Jacking Systems, Ltd.



Left: Brockhouse industrial torque converter coupling



Combination Variatio gear unit showing how a speed section is mounted with a standard unit to increase ratio and double number of speeds



Sectional view of a Hamworthy hydraulic control valve

frames for extra rugged duty, a special circular construction enabling them to be rolled into position when necessary for confined spaces. Motors are also the principal item on the English Electric Co.'s stand together with a scale model of a large transporter powered by their motors.

A working model of an electrically operated overhead travelling crane demonstrates a new device known as "Collimit" for preventing collision between two cranes working on the same track. This can be seen on the stand of the British Thomson-Houston Co., Ltd., who also have on show the control console and cubicle used for a Ruston-Bucyrus 110RB diesel-electric excavator.

Carter Gears, Ltd., place the emphasis on working units and all methods of speed control are on view including electrical remote control, hydraulic relays and hand controls, and a comprehensive display of the company's hydraulic, infinitely variable speed gears, and variable speed units can be seen. Gears are also shown by David Brown Industries, Ltd., and a recent addition to their range is the size 4 "Coventry" geared motor suitable for drives of 2·5-15 h.p. at speeds between 13 and 395 r.p.m. with a choice of any one of 31 output speeds. David Brown industrial tractors of the crawler and wheel type are made for bulk handling and a model shown for the first time at the exhibition is the 301C wheeled tractor: this has a 41 h.p. petrol engine and a maximum drawbar pull of 3,700 lb.

A range of pneumatic control equipment newly designed for the remote control of marine engines, fluid couplings, variable pitch propellers and all installations where similar control of such features as engine speed and transmission is required are shown as working exhibits by the Westinghouse Brake & Signal Co., Ltd. This company's system of mine traffic control for underground locomotive haulage is represented by a working model. Their rectifier division demonstrates special battery charging equipments intended for electric vehicles. The main exhibit by the Igranic Electric Co., Ltd., is a demonstration of crane control gear using a 1 : 12 scale model of a 10 ton electric derricking crane together with a similar scale model of an Igranic circular type lifting magnet. The models are operated by full size control gear. Sharp Control Gear, Ltd., have on view a range of controllers for both manual and automatic battery driven vehicles, crank-handle-operated cam controllers from 30 A to 150 A a.c. or d.c. and a full range of their limit switches. The Tirfor pulling and lifting machine can be seen on the stand of Tirfor, Ltd. This is a useful hand operated pulling block which can be used amongst other things for the erection of overhead line poles, the tensioning of conductors, for the pulling through of underground cables, etc.

PUMPS

The Plessey Co., Ltd., are demonstrating a wide range of hydraulic equipment including a selection of pumps and control and relief valves designed for use in any application where goods have to be pushed, pulled, lifted, lowered, or tilted by mechanical means. Of particular interest are a 3-section telescopic arm of 35in stroke with a maximum operating pressure of 2,000 lb/sq in and a double acting short stroke arm with a piston diameter of 1½in and a similar maximum operating pressure.

So far as fluids are concerned mechanical handling has been achieved by the use of pumps for many hundreds of years and a pump that has kept in step with contemporary needs is the appliance made by Monopumps, Ltd. These pumps can prime themselves and possess powerful suction capabilities, and steps are being taken to enable them to be used for handling dry powders as well as fluids. A completely new range of gear pumps is introduced at the exhibition by Keelavite Rotary Pumps & Motors, Ltd. These are specifically designed for mechanical handling and earth moving machinery and are assembled from only four main components. The pumps immediately available displace

4, 5, 7 and 9 gal/min per thousand r.p.m. respectively; the peak speed is 3,000 r.p.m. and the maximum continuous pressure 2,000 lb/sq in. High pressure hydraulic gear pumps are also shown by George Angus & Co., Ltd., who demonstrate a new range to be sold under the trade name of "Norga" and providing a delivery range at 1,000 r.p.m. of from 2 to 16 g.p.m. Smiths Jacking Systems, Ltd., show high speed radial plunger pumps and Hamworthy Engineering, Ltd., also exhibit a selection of hydraulic pumps.

Present at nearly all exhibitions of this nature is the Rawlplug Co., Ltd., whose ubiquitous product has revolutionised fixing in masonry. Durium tipped drills were introduced some time ago for boring holes in masonry and the Rawlplug Co. now produces a low speed electric drill especially for use with these. Gears play an important part in all mechanical handling equipment. Electropower Gears, Ltd., show geared motors and speed reducers of helical spur reduction from ½ to 100 h.p. together with totally enclosed electromagnetic brakes, and self-contained electric motors with speed reducers. Opperman Gears, Ltd., show not only their products but also a selection of gears to illustrate the various types of gear cutting which are carried out in their works.

The British Transport Commission has a stand at the exhibition containing a rail handling terminal display made up of a 30ft model railway, a British Railways goods yard, roadways with B.R.S. vehicles, etc. The stand is a joint one of the rail, road, dock and canal services and illustrates the use of mechanical equipment by these four branches. Practical demonstrations of loading and unloading palletised traffic to and from road and rail vehicles are being given twice daily in the exhibition buildings.

Aircraft Electrical Equipment

Convention at the Institution of Electrical Engineers

A THREE-DAY convention on the electrical equipment of aircraft was held at the Institution of Electrical Engineers from Wednesday to Friday of last week. The proceedings were opened by the Minister of Supply, The Rt. Hon. Reginald Maudling, M.P., and Sir George H. Nelson, President I.E.E., was in the chair.

Mr. G. R. Edwards, C.B.E., vice-president of the Royal Aeronautical Society and managing director of Vickers-Armstrongs Aircraft, in giving the introductory talk, said that many makers and users of aircraft had a healthy distrust of anything done electrically. One cause of the trouble was that electrical engineers wrapped themselves up in a cloak of mystery. Electrical equipment in aircraft must be reliable, and installed in such a way that it was given the opportunity to work; if it did not, an alternative must be available.

All electrical equipment which was put into an aeroplane had to be tested before being put in, despite the fact that it had been tested in the factory before being delivered, and the overall reject rate was about 25 per cent, which was far too high. There might be a tendency for electrical firms to rely on development contracts sponsored by the Ministry of Supply and directed mainly to military requirements rather than to the reliability and economy necessary for civil aircraft.

As more British aircraft were sold abroad, the ratio of American to British electrical equipment in those aeroplanes progressively increased. It was no use offering the aircraft constructor a motor which was 0·4 lb lighter than anything previously available, if it was necessary to put in 10 lb of ducting and 5 miles an hour of air cooling drag to keep it from melting. He was sure that British electrical engineers could produce equipment as good as any in the world and he wanted them to do it.

DEVELOPMENT OF POWER SUPPLY SYSTEMS

The convention was held in five sessions. In the opening one a paper, "Electrical Equipment in Aircraft: Survey of Past and Present Practice and Future Trends in Design," was presented by Mr. S. F. Follett (Ministry of Supply). This describes briefly the development of aircraft electrical power supply systems from the earliest days of flight until the present time. Originally consisting of simple 12 V d.c. systems of 250 W output, they have grown to about 160 kW for the present generation of large aircraft whilst 400 kW seems likely in the next generation. Where complete electrical de-icing is included the future estimated requirements have been put as high as 700 kW.

The special conditions with which aircraft equipment have to cope are considered under several headings: reduced atmospheric density at high altitudes has two main effects—the electric strength of air leakage paths is reduced, and the cooling properties of the atmosphere are lessened; lowered humidity at high altitudes may increase commutator and slip-ring wear a thousand times; and reduced temperatures at high altitudes may be more than outweighed by kinetic heating at very high speeds.

Weight and volume are important: an increase of equipment weight means a consequential increase of n times in that of the complete aeroplane, where n varies from about 4 in a large civil plane to over 10 in a very high speed military plane. Acceleration and vibration impose exceptional mechanical stresses and the reduction of fire risks necessitates special features of design. Reliability is a paramount consideration, and endurance testing under simulated conditions is recommended as an economical method of forecasting performance. Cost is perhaps the only respect in which the requirements for aircraft equipment are less stringent than for ground plant.

Tables are given showing the chief uses and consumptions of electricity in a modern aircraft, and the average loads on the 112 V busbars of a typical modern bomber, totalling 39½ kW.

Reference is made to the adoption as an international standard primary supply of a 3-phase 208 V 400 c/s a.c. system which is likely to be used in future large aircraft.

DISCUSSION

Mr. E. T. Jones (Director-General of Technical Development (Air), Ministry of Supply), in opening the discussion on Mr. Follett's paper, said that any firm responsible for the design and development of aircraft should itself have

a fairly strong electrical engineering department. Failure of a small item of electrical equipment or malfunctioning through bad circuitry might prove catastrophic, particularly at supersonic flight speeds in certain circumstances. Since civil aircraft would soon be following military aircraft into the supersonic speed range good practice was essential.

Mr. R. H. Woodall (Rotax, Ltd.) suggested that the electrical engineer could increase the maximum operating temperature of his equipment. Inorganic insulating materials should be the order of the day. With the increasing stagnation air temperatures due to supersonic flight the range of temperature over which equipment had to operate would go from −70 to about +160 deg C. It would help a great deal if the lower limit could be raised to −40.

Manufacturers of electrical equipment were alive to the necessity for the prolonged testing of electrical systems and several firms had now installed systems laboratories which specialised in this work.

Mr. R. S. Stafford (Handley Page) said that the situation which Mr. Edwards had outlined had caused grave concern to the Society of British Aircraft Constructors, and their actions had resulted last year in the preparation of a code of practice for rotating electrical machinery. They were now examining ways of improving the reliability of other electrical equipment and were drawing up a code for switchgear. Difficulty arose through not specifying clearly enough the conditions in which the equipment would be expected to work, and from unreliability due to defects in mechanical design.

For high altitude operation it seemed clear that a.c. generation and utilisation would provide welcome relief from problems of brush wear, and for large aircraft there could be emergency a.c. supplies from auxiliary power plant.

Mr. J. R. Rice (Vickers-Armstrongs Aircraft) recalled that there had been a naval aircraft in 1946 which had a 200 V 400 c/s, 3-phase constant voltage and variable frequency supply, and in the a.c. machines there was a non-magnetic brake which really worked and which had still to be equalled. Manufacturers of electrical equipment still thought of + 55 deg C as a realistic top temperature, but for high speed aircraft it should be about 100 deg C.

Mr. V. A. Higgs (B.T.H.) said that the problem of operating brush gear on slip-rings was just as difficult as on commutators. The real difficulty with brush gear was that at intervals it was necessary to look at the machine to see whether the brushes were still there. With better installation and accessibility there might not be so much clamour for long periods between overhauls. It was much easier to make a machine consistently reliable over a short period, especially if it was highly rated, and if it could be got at easily it might pay to aim to change it after 100 hours rather than aim at the present target of 1,000 hours. It was most important to simplify electrical installations and to train ground crews to make adjustments in the field.

Mr. J. F. Lewis (Ministry of Supply) supported Mr. Higgs's emphasis on simplicity, and particularly simplicity of adjustment. Mr. D. B. McKenzie (R.A.E.) underlined the seriousness of the lack of high-temperature insulating materials, and particularly of flexible materials, and the need for basic research work in this field. It was optimistic to suppose that such materials could be obtained from America.

Several other short contributions were made to the discussion. The author, in a brief reply, did not agree with Mr. Higgs on the possibility of changing units at intervals of 100 hours, which would be far too costly.

ELECTRICAL APPLICATIONS IN AIRCRAFT

The second session of the convention consisted of three papers. The first entitled " Factors in the Utilisation of Electrical Power in Aircraft " was by Mr. H. Zeffert (Vickers-Armstrongs (Aircraft), Ltd.). After outlining the chief factors affecting the choice of supply system it lists five typical systems in current use. Each of the chief uses of electricity in modern aircraft is described in turn and loads and circuits are given for the more important applications. Propeller control and de-icing are treated at some length and the safety aspect of each application is stressed. The automatic features normally found, namely, automatic direction finding and auto-pilots are briefly described, and the most widely known navigational systems are listed with brief particulars. Auxiliary power supplies are dealt with including those for radio and radar equipment sometimes requiring two or even three different types of supply.

The second paper was " Aircraft Radio Power Supplies: A Survey " by Mr. B. J. O'Kane of Marconi's Wireless Telegraph Co., Ltd. This traces the history of radio power supplies from a simple accumulator supplying a few hundred watts, through wind-driven generators, to rotary convertors running off a central battery which is itself charged from engine-driven generators. This last system, which is the one in most common use to-day is described in some detail. Listed equipment for a modern British long-haul civil airliner gives a total installed radio load of about $3\frac{1}{2}$ kW.

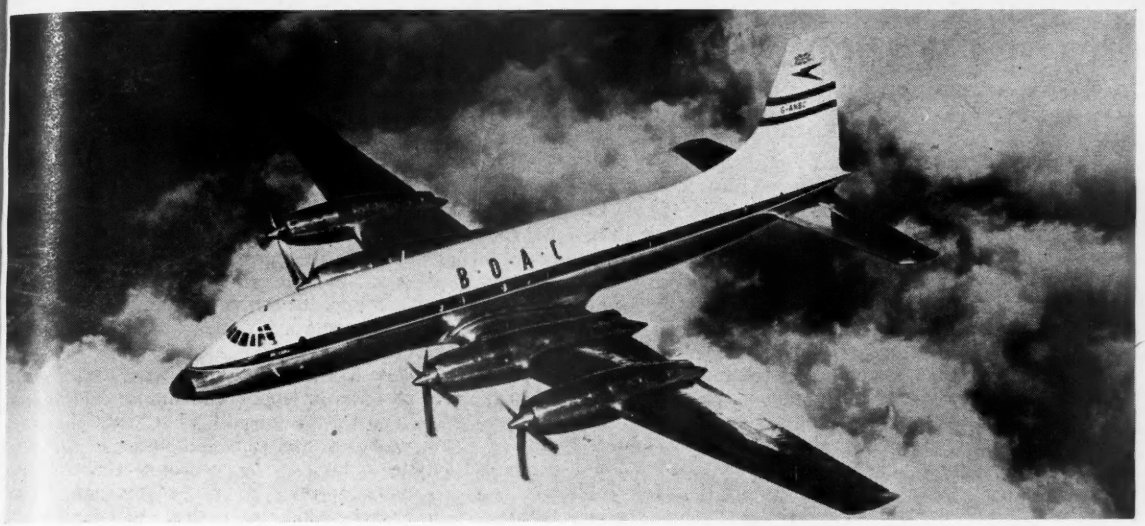
Probable future requirements are outlined and the advantages of a constant-frequency a.c. supply are stated. With increasing power requirements the operation of radio equipment from a.c. is expected to become more and more the preferred system in the future. When operational requirements are sufficiently standardised (e.g. for long-stage routes) to make it technically practicable to adopt centralised radio power supplies feeding a number of items of equipment the gain in serviceability has to be weighed against the loss in flexibility.

The author criticises the British proposal for a standard a.c. system for civil use, namely, 200 V 400 c/s 3-phase, with the neutral earthed at the generator only. He points out that this means that 115 V cannot be obtained between line and earth as was envisaged in earlier proposals. Since present-day radio equipment, both civil and military is designed for 115 V the suggested standard does not suit the radio designer.

Messrs. J. F. Lewis and E. Lloyd of the Air Registration Board presented the third paper of this session, on " The Airworthiness and Reliability of Aircraft Electrical Systems." In this standards for the airworthiness and reliability of electrical systems and equipment are discussed in relation to the overall standards for the aircraft and its engines, and the effect of duplication of systems and equipment is considered. Curves are given for the accidents per million aircraft miles on scheduled passenger services for operations by the United States and the United Kingdom from about 1935 onwards. Both curves drop rapidly and the figure has roughly halved in the last ten years. About 44 per cent of the accidents involved fatalities and from 9 to 29 per cent were attributable to lack of airworthiness. Of the latter, electrical causes might account for about one-fifth.

The control and protection of generating systems is examined in relation to experience, particularly of total power failure, and it is concluded that systems have not proved sufficiently sound in the past to justify entire reliance on them in aircraft which depend on electrical supply for their continued flight. Various methods of providing duplicate and emergency supplies are described.

The electrical control of engines and propellers is discussed in relation to engine reliability, and recommendations are made for improvement. Inadvertent operation



The Bristol "Britannia," Britain's newest long-range turbo-prop civil air liner

of some services may constitute a major hazard and a detailed assessment is made of the causes and remedies. Fire and explosion risks resulting from the fuel and other inflammable liquids which have to be carried are examined in considerable detail.

The paper concludes with an appendix summarising the evidence in 39 "incidents" involving complete failures of aircraft electrical systems during 1948-54.

DISCUSSION

Mr. G. W. Black (Ministry of Supply), opening the discussion on the three papers, emphasised that electrical equipment which would be required in future aircraft should be in the development stage now, and the electrical installations should be engineered into the aircraft at the same time that the aeroplane configuration was taking shape and not fitted in afterwards. Lewis and Lloyd said that an increase of 30-50 per cent of the mean load should be expected and provided for in arranging electrical power supplies, but he thought that 100 per cent reserve power should be provided at the design stage.

Mr. H. J. Rea (Rotax, Ltd.) emphasised the importance of early agreement on a.c. supply characteristics, so that electronic designers could get to work on the basis of a standardised a.c. system. Much present equipment was designed to work off invertors from the 28 V supply, but a power-unit operating from 400 c/s a.c. could be substituted for the invertor. If electronic equipment had to operate off a common a.c. supply it would raise the problem of surges. It might be necessary to introduce stabilisation in the e.h.t. lines, which would increase the weight and decrease the reliability.

Mr. M. Hancock (R.A.E.) showed a photograph of a mass of metallic rubbish recently collected from one military aircraft. He did not know how it got there, but it was not a good thing to have swilling about in the electrical system. He also showed photographs of two switches, which had wiring defects liable to cause accidents.

Mr. E. A. Farthing (Rotax, Ltd.) urged agreement between the authorities concerned on a common basis for vibration testing. There was at present a wide variation between the requirements of the specifications. Bump and shock tests would be necessary for the aircraft of the future in view of the high speeds now reached. In comparing prices of British and foreign accessories one must consider what tests they had to pass.

Mr. P. F. Cook (Air Registration Board) did not agree with Dr. O'Kane's statement that valve manufacturers specified 7 per cent as the maximum variation from nominal heater voltage and were not prepared to guarantee the life of their products if the variation was exceeded. He knew of cases where 10 per cent had been agreed to. This scrutiny by valve application engineers and electronic equipment designers had been the most valuable single factor in promoting the reliability of electronic equipment, which in some cases could be improved by a factor of 10. Mr. Cook saw no reason for a central radio supply unit, a separate radar supply unit and a separate instrument supply unit when all these items of equipment were essentially the same.

Mr. L. F. Wainwright (College of Aeronautics) said that those who worked on industrial systems and equipment were able to use much more advanced methods of study and analysis than those available to aircraft electrical engineers. The application of tensor analysis methods to aircraft was most desirable. Advanced methods of analysis were being applied in the U.S.A., on Super-Fortresses, as long ago as the end of the last war.

Dr. D. C. Flack (Bristol Aeroplane Co.) pointed out that with standard equipment it was always the next larger size and not the next smaller which had to be used. Against that must be set the increased cost of the design, manufacture, and maintenance of small quantities of new non-standard equipment. He agreed with Dr. O'Kane that for electronic equipment a closer tolerance than ± 5 per cent on the supply frequency and voltage was not required.

Mr. J. C. King (English Electric Aircraft), emphasising the need for simulated testing, maintained that most trouble arose because certain items had not been properly simulated on the rig. There must be complete specification of the working conditions laid down at the beginning. It was no use testing one component only; tests on three or more were necessary, and they should include production as well as prototype components.

All the authors replied. Mr. Zeffert maintained that it was not true that the Americans had technical superiority everywhere; it lay rather in the work of one or two companies, and in particular Boeings, who had over a thousand engineers in their laboratory.

It is hoped to publish a report of the remaining sessions in next week's issue.

I.E.E. Annual Report and Accounts

Copies of the annual report of the I.E.E. Council for 1955-56 and of the accounts for the year ended 31st December, 1955, to be presented at the annual general meeting on 17th May, can now be obtained by members of the Institution on application to the secretary.

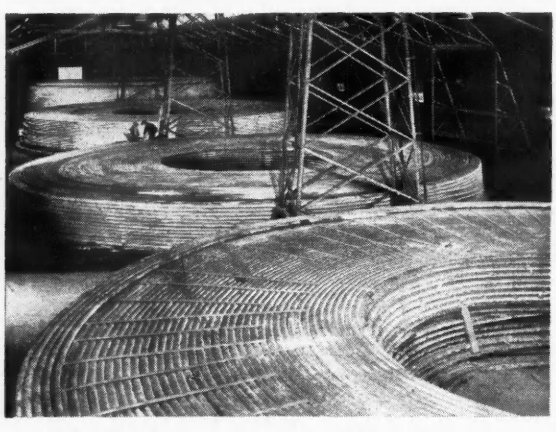
Vancouver Island Power Link

World's Longest Undersea 138 kV Cable

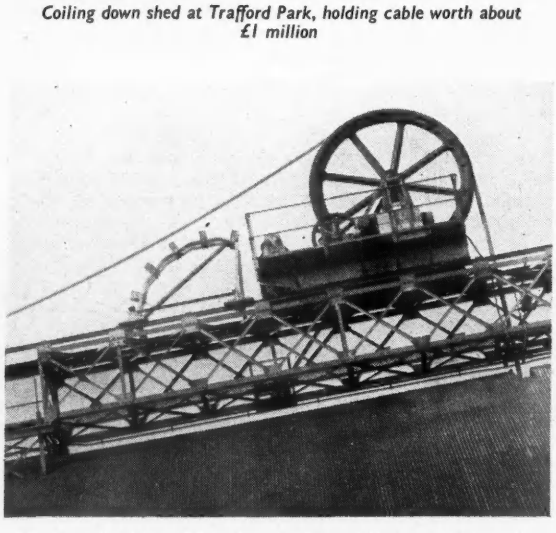
LAST week we had the opportunity of visiting the works of British Insulated Callender's (Submarine Cables), Ltd., at Trafford Park, Manchester, to see their recently manufactured 138 kV cable being coiled into the hold of the *Ocean Monarch* for transport and laying between the mainland of British Columbia and Vancouver Island.

The project is that of the British Columbia Electric Co., who plan to link the h.v. system in the south of Vancouver Island with the hydro-electric system of the mainland. The alternative would have been to build additional thermal stations on the island, a more expensive undertaking.

Two years ago the plant to manufacture the cable did not exist at Trafford Park but in the last twelve months manufacture has been completed and the cable is ready for shipping ahead of schedule. The cable link is due to be in operation during September next and the actual route, determined from extensive marine surveys in 1953-54, is from a point on the mainland south of Greater Vancouver and close to the mouth of the Fraser River, under Georgia Strait to an intermediate island, then under Trincomali Channel to Saltspring Island where it will connect up with the existing h.v. overhead transmission network. In some places the cables will be submerged more than 600ft below sea level.



Coiling down shed at Trafford Park, holding cable worth about £1 million



On the roof of the coiling down shed the cable is guided on to the conveyor which leads to the cable ship

The cable system will consist of single-core cables, each approximately 16 miles in length, and similar cables each about $3\frac{1}{2}$ miles long for the inter-island section: the total cost of the contract is over £1 million. Each of the individual lengths of cable has been manufactured in one piece and no joints are involved in the operation. The diameter is four inches and this is thus the largest continuous long-length power cable ever to be installed. The cable is intended to transmit about 100 MW, has a cross-sectional area of 0·35 sq in and operates under a gas pressure of 300 lb/sq in. In addition to the three single-phase cables, two spare lengths are to be laid.

Clearly, cables many miles in length and weighing hundreds of tons cannot be put on drums, and special loading and transport arrangements are, therefore, necessary. From the factory to the dockside a purpose-designed power-operated gantry system has been constructed. This crosses the Trafford Park Road at a height of 45ft and extends for a total length of 1,100ft to the quay of the Manchester Ship Canal, where the gantry proper terminates on a tower 120ft from the edge of the quayside. From here two swivel beams, which can be swung through a small arc on rails mounted on a cross gantry, provide twin cable-runs directly above the holds of the cable ship.

For the storage of the cable between manufacture and loading a steel-clad coiling down shed has been specially constructed directly beneath a section of the gantry. This shed is 350ft long, 74ft wide and has a height of 43ft; this permits an unobstructed floor area of approximately 20,000 sq ft for cable storage and houses five cable stacks each with a diameter of up to 60ft.

On the gantry above the coiling down shed a pair of light rails form a track for two sheave-winches which, mounted on skids, can be moved into position over any of the five coiling bays. When the cable-laying ship is alongside, a French-made caterpillar winch mounted on the gantry pulls a cable from its coil in the shed over a quadrant at gantry level and along the gantry to the winch, then pushes it along one of the swivel beams so that it can be lowered and coiled into the ship's hold directly below. Telephone communication is maintained between quayside, winch positions and each coiling bay in the shed during loading and coiling operations.

The most suitable method of transporting the cable to the laying site is by a cable ship specially equipped to handle cables of this size. For the British Columbia contract the second largest cable-laying ship in the world has been chartered,' the 4,600-ton *Ocean Layer* belonging to Submarine Cables, Ltd.

Built in 1948, this single-screw ship has recently been converted for cable-laying and is also the first British ship to be fitted with a Pleuger "active rudder." This device consists of an electrically driven auxiliary propeller housed in the pear-shaped rudder blade and designed to increase the vessel's manœuvrability—an essential feature in cable-

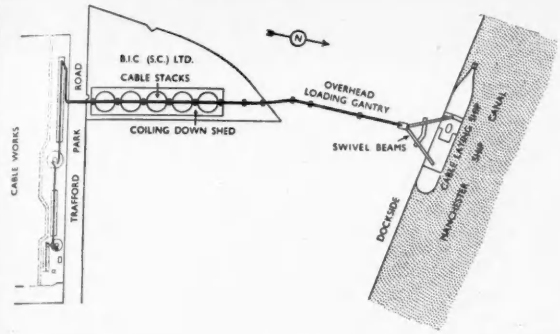


Diagram of the conveyor system which has had to be built in order to transfer the manufactured cable to the ship

laying operations. The service speed is 11 knots, and there is a complement of 83 officers and men. The modern cable-handling gear and testing equipment fitted, incorporating the latest electronic control devices as well as the most up-to-date navigational aids, are considered to make this the best equipped cable ship in existence. The vessel has four main cable tanks with a total coiling capacity of 76,800 cu ft, two bow sheaves for picking up and paying out, and one after paying out sheave. The cable engines are steam driven with a multi-ratio gear drive.

The total weight of the Vancouver submarine cable now being loaded is over 3,800 tons, and when loading is complete the *Ocean Monarch* will sail for Vancouver via the Panama Canal, taking some 40 days for the voyage. The cable-laying operations in Georgia Strait will be carried out from the ship.

It may be recalled that the B.I.C.C. Group collaborated with the Central Electricity Authority in 1953 in full-scale trials for the England to France cross-Channel cable project and that recently the New Zealand Government awarded the company an investigation contract to examine and report on the possibility of a submarine power cable connection between the North and South Islands across Cook Strait.

In a short ceremony held to commemorate the beginning of shipment Mr. W. H. MacFadzean, chairman of the B.I.C.C. Group, introduced Mr. W. A. McAdam, the Agent General for British Columbia, who in expressing appreciation for the speedy completion of manufacture said that this type of export was exactly that which Canada wanted from the United Kingdom—one which incorporated the maximum of technical skill in design and manufacture.

E.R.A. LUNCHEON

Appeals for Increased Support

THE annual luncheon of the British Electrical and Allied Industries Research Association was held in London on 2nd May with Viscount Chandos in the chair in the absence of the president, Lord Citrine.

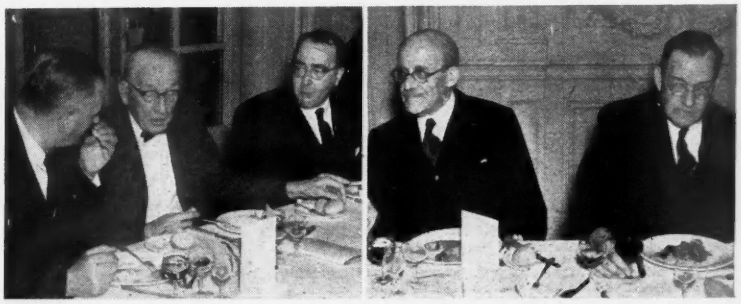
Sir John Cockcroft, the principal guest, in proposing the toast "The E.R.A.", said he had been mixed up with electrical research for a good part of his life and he recounted some of his earlier experiences.

Sir John said that out of the applied research on nuclear physics in the war came the exciting adventure of nuclear power development. The Queen was to open Calder Hall in October. For the last year or so the drawing boards of the "Big Four" had been occupied in designing its commercial successors, and all had every faith that as a result of their efforts they would produce something much better and bigger than the original prototype. All that had been made possible by the expenditure on research and development of effort measured in terms of a few thousand man-years. He was sure that a similar investment in the future would pay dividends. None of the visualised projects would come to fruition unless we were prepared to put a big research and development effort into them.

The farthest away of any of the projects of the future was the rather glittering prospect of the fusion reactor employing the light elements. It was a very exciting adventure in basic science, combining the fields of high temperature physics and nuclear physics, and it was especially interesting to him since his first work in nuclear physics was with the light elements. What had been reported by the Russian scientists who had visited this country showed that scientific advance did not depend on national frontiers and that any country which was prepared to devote a large amount of resources to scientific effort on a project would at any one time get roughly to a comparable stage.

Nuclear physics was not the only field of work in which there had been exciting projects since the war. There had

Left: Viscount Chandos and Sir John Cockcroft. Below, left to right: Mr. O. W. Humphreys, Mr. P. V. Hunter, Dr. S. Whitehead, Sir Harry Railing and Sir John Hacking. Since these photographs were taken we regret that Dr. Whitehead has died; a note on his career appears in our Obituary section



been a very interesting application of solid state physics to electronics, the production, for example, of transistor valves. As a result of this we could look forward to many changes. He was told that we could contemplate the "transistorisation" of the Post Office. The Americans had already started an experiment on transforming solar energy into electrical energy on a small scale.

There had been the development of the digital computer. He was told that a single data processing machine of the electronic type could command a rent of £250,000 per year. In the United States 100,000 engineers and technicians were engaged on computer work.

With the rapid growth of the electrical industry, which was inevitable, the scale of research and development in this country would also have to grow, and the only question which was raised from time to time was whether we could have enough young scientists to carry on the work in future. He was sure of one thing, and that was that the quality of our young scientists was one of our biggest national assets. We were not short of the highest range of ability but we seemed to be short of the "big battalions," and many steps were now being taken to try to cure that problem. The Americans sent one in four of their children to college, the Russians one in eight and we sent about one in thirty. We were apt to comfort ourselves by saying that perhaps half of the students in America did not make the grade and our universities were better than theirs, but there was a big gap in development effort, and the country had to fill that gap.

Lord Chandos, in response, said that about two years ago the problem of the impending shortage (he was thinking more of the "big battalions," to which Sir John had referred) in the scientific world, was on the whole known to and realised by only a very few. Since then great publicity had been given to the subject, and now the shortage seemed to be very well understood. An advance had been made, but it was only a beginning, and it did not carry any hope that the needs could be filled, though he thought they would be.

The American universities possessed truly vast endowments, and our ancient foundations of learning could not match the American figures in money, and although they made notable contributions to learning and science, it was as well to realise that as time went on the immense financial resources in America would certainly tend to produce a great increase in the quality as well as in the numbers of the graduates who used the universities. The Russian Academy of Science had 150,000 students on a 5½ year course in Moscow alone, and they were trained with the help of equipment which had hardly ever been surpassed and not even equalled in the Western world.

Britain's contribution to research was outstanding, but in the application of radical and fundamental discoveries we had fallen short of the lead which our chief men had given us. The Americans were rapidly developing some of the fundamental discoveries which might be ascribed to the efforts of the British.

Turning to the electrical industry, the more one looked at even the conventional fields of traction or at the new fields of automation or electronics or nuclear fission, one could see ever-increasing needs for research. If we could maintain our front rank place technically, which he thought we could, and if we could supply the necessary teams of engineers who could turn to use and manufacture many of the discoveries, we had nothing to fear.

He referred to the new headquarters of the Association at Leatherhead, and said that the Association would soon be short of money, and he appealed for increased support.

Mr. F. H. Bramwell, chairman of the Council, proposed a vote of thanks to Viscount Chandos. He said that while we had no need to feel an inferiority complex, we did not seem to be able to develop our original ideas as quickly as some other countries could, and in that respect an appeal could only be made to the electrical manufacturing firms, who were the only people who could do the real development work.

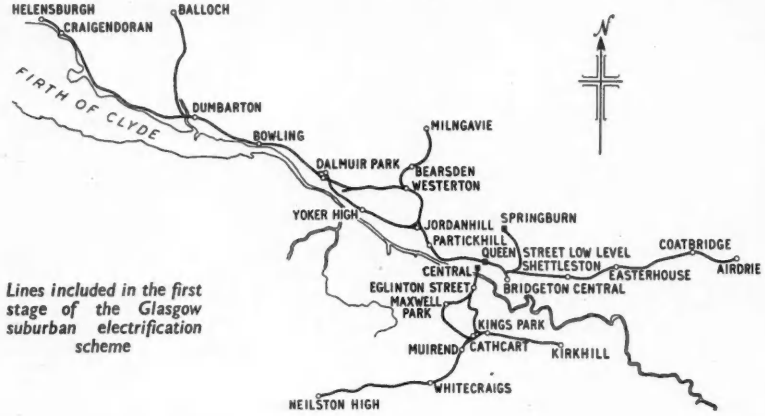
He appealed to the electrical manufacturing firms to provide more income for the Association to enable it to take full advantage of the research facilities established at Leatherhead and he urged them to allow common problems in research to be dealt with by the Association. This would mean less total expenditure and a more economical use of the available supply of scientists and technologists.

GLASGOW RAILWAY ELECTRIFICATION

AS briefly reported in last week's issue, the British Transport Commission has authorised the electrification of 71 route miles of railways in the Clyde Valley at a cost of just over £13 million. The routes to be electrified are as follows:—*North of the Clyde*: Glasgow Queen Street Low Level to Helensburgh and Balloch via both Clydebank Central and Drumchapel; Milngavie; Airdrie; and Bridgeton Central. *South of the Clyde*: Glasgow Central to Kirkhill; Neilston High; and Cathcart Circle lines.

At a Press conference held in Glasgow Mr. G. W. Stewart, assistant general manager, Scottish Region, said that these routes comprised the first stage of the Glasgow suburban electrification scheme. The Scottish Region was still developing its plans for the second stage and had under consideration a further 119 route miles from Glasgow Central and St. Enoch, south of the Clyde, possibly to Gourock, Wemyss Bay, Kilmacolm, Kilmarnock, East Kilbride and Motherwell.

Work on the first stage was expected to start early next year and it was hoped to commence operating electric train services within four years. The electrified lines north of the river would be ready before those to the south as the latter presented a number of major engineering problems, such as the complete colour light resignalling of Glasgow Central station and its approach lines over the river.



Lines included in the first stage of the Glasgow suburban electrification scheme

Up-to-date rolling stock consisting of three-car multiple unit sets, capable of being coupled into six- or nine-coach trains or run independently as three-coach trains, would be built specially for the new services. On all lines to be electrified the train services would be speeded up and run on a more frequent and regular interval basis with additional trains at the peak periods.

Subject to the approval of the Minister of Transport and Civil Aviation, the electrification system to be adopted would be 25 kV a.c., with overhead wire conduction.

RESTRICTIVE TRADE PRACTICES BILL

Further Amendments Debated

WHEN the Committee Stage discussion on the Restrictive Trade Practices Bill was resumed in the House of Commons Mr. Eric Fletcher moved to delete the provision that the Bill would not apply to any licence granted by the proprietor or the licensee of a patent, any assignment of a patent, or any agreement for such licence or assignment.

Mr. Robert Edwards produced the carton of a three-way plug on which was printed the statement that the plug was covered by one or more letters patent and was sold under the express condition that it should not be resold or offered for sale, new or second-hand, used or partly used at lower than the list price. This he considered to be a deliberate abuse of the patent law.

Mr. Derek Walker-Smith, Parliamentary Secretary, Board of Trade, replying to the debate, said patents were excluded because they were already dealt with by an independent code of law, which contained sufficient safeguards for the public against abuses. To superimpose a duality of control by making patent agreements subject to registration and investigation by the Restrictive Practices Court would precipitate a conflict of jurisdiction between that court and the Comptroller of Patents.

Mr. Donald Wade said it often happened that a manufacturer obtained a licence for the manufacture of a device, then arranged sub-licences with other manufacturers, who then had an agreed price for the article, thus eliminating price competition. The Bill might provide an unintended loophole for that kind of restrictive agreement.

Mr. Walker-Smith said it was his impression that such agreements would not come within the exceptions in Clause 6 (Excepted Agreements), but if that was found not to be so, he would take steps to correct it on the Report Stage.

The amendment was defeated by 263 votes to 222.

Mr. Walker-Smith moved amendments to put registered designs into the same class as patents so that an agreement would be excluded from Part I of the Bill where restrictions were imposed only in respect of articles to which the design applied. The amendments were agreed to.

Export Agreements

Mr. Thorneycroft, President of the Board of Trade, moved an amendment to exclude from registration under Part I agreements relating exclusively to exports and goods bought, sold or delivered outside the United Kingdom. He said that where export agreements were interlocked with internal, mutually restrictive arrangements they would be registrable with the Registrar of Restrictive Practices. Where there was a separate, but mutually restrictive export arrangement, it would fall within the terms of Clause 25 in Part II of the Bill dealing with references to the Monopolies Commission.

Mr. Wade said he was anxious to know whether the practice of quoting even prices for contracts overseas would be caught in Part I. The best example he could quote was that of the contract which was lost when level tenders were quoted for the Snowy Mountains Hydro-Electric Power Authority. It was stated then that British heavy electrical firms lost a big contract from that Authority because they offered virtually identical tenders.

Mr. Thorneycroft said that if the agreement was exclusively related to exports, as this one might be, it would come under Clause 25, Part II. If it were a mixed agreement the whole agreement would be registrable under Part I of the Bill.

The amendment was agreed to.

In a debate on another amendment, Mr. Thorneycroft made it clear that the Bill did not apply to "know-how" agreements as such, but the Government could not adopt the principle that any price ring or exclusive dealing arrangement would be exempted from the Bill if it contained some "know-how" provisions. That would give an obvious loophole. Although he thought that the wording of the Bill was satisfactory, the Board of Trade would be happy to listen to any representations on this subject before the Report Stage was reached.

When another amendment was discussed, the President indicated that he was not satisfied that there was a sufficient penalty to impose when the parties to an agreement deliberately refused to register an agreement and he would try to strengthen the provisions of Clause 8 (Particulars to be Furnished for Registration).

On considering Clause 11 (Power of Registrar to Obtain Information), an amendment was agreed to making it necessary for the Registrar to get the authority of the High Court before his authorised representative could enter premises to look for information.

Mr. Thorneycroft, recommending the acceptance of the amendment, said he would try to find an alternative arrangement which would obviate the necessity of people prying about other people's premises.

When Mr. A. J. Irvine moved to delete from Clause 13 (Commencement of Proceedings and Venue) the provision that no proceedings would be started more than three years after the commission of an offence, Mr. Thorneycroft said he would later bring in an amendment to meet this point.

Public Safety

On Clause 16 (Presumption as to the Public Interest), Mr. Hector Hughes moved to delete paragraph (a) which states that a restriction shall not be deemed contrary to the public interest if the court is satisfied "that the restriction is reasonably necessary for the protection of the public in connection with the purchase, consumption, installation or use of goods requiring special knowledge or skill in that connection." He said the interminable arguments which would take place on the definition of these phrases would delay and frustrate the court.

Mr. Thorneycroft thought it reasonable, if a restriction was to safeguard the public against some injury, that industry should be allowed to put their case. If people who built houses decided that they would employ only electrical engineers to install the wiring in a house in such a manner that it was not burned down, they might have a stop list or an exclusive dealing arrangement which was restrictive, but it was a sensible one. This paragraph was meant to cover such arrangements. At a later stage he would propose to substitute the word "safety" for "protection."

Mr. J. Grimond said he did not know what was meant by "requiring special knowledge or skill in that connection." If a restrictive practice was required to protect the public, surely that arose whether the use of goods required special knowledge or not. He himself could plug in an electric plug, but if someone put on to the market a plug which, the moment he came to switch on, blew him up that certainly was an instance in which the public needed protection. That was a matter for common law or the Government.

Mr. Anthony Fell thought it was normally in the interests of firms to produce things which were safe.

Sir Lynn Ungoed Thomas said that might not be so. There had been the instance of electric fires and guards for them. The point was that matters of public safety should not be left to organisations whose concern was not public safety.

Mr. Thorneycroft said any fair-minded person would agree that it should be open to an industrialist or a supplier to show that a restriction was in the interests of safety and was reasonably necessary. If legislation already safeguarded the public interest, of course the industrialist would not get very far with that argument. That was the

short answer to this debate. The Registrar would say, "Look at the Act dealing with electric wiring. That covers the whole thing."

The amendment was negatived.

Mrs. Castle moved to delete paragraph (b) which allows the court to hold that a restriction is in the public interest if its removal "would deny to the public as purchasers, consumers or users of any goods other specific and substantial benefits or advantages enjoyed or likely to be enjoyed by them. . . ."

Mr. Thorneycroft said it was important to realise that defences under (a) and (b) were not the final answer. They merely defined arguments which could be admitted before the court.

Co-ordinating Research

Mr. Eric Johnson and Mr. John Baldock supported the paragraph because trade associations had a great job to do in maintaining high standards, in co-ordinating research and learning from industries overseas.

Mr. Thorneycroft said it was clearly necessary to have this provision. One had only to consider the reports of the Monopolies Commission about cables and electric lamps to see this. The Commission went into these industries and found that, on balance, there was a benefit in having arrangements which led to the exchange of technical information within the groups. He was not accepting that unless there was a ring there was no research, but he thought the effect on research and the exchange of technical information were matters which could not be denied to people arguing before the court.

The amendment was negatived by 225 votes to 173.

Sir Peter Roberts moved a new paragraph to permit the argument that the removal of a restriction would have a serious and persistent adverse effect on the carrying out of technical education, research and development.

Mr. Thorneycroft said that such arguments could be introduced under paragraph (b).

Mr. Gresham Cooke said this question affected chiefly the heavy engineering and electrical industries in which large sums were devoted to research. He was told that one machine required for testing purposes in the electrical industry cost £1 million. It would be ridiculous if the products of those industries were sold at their barest cost, without anything being allowed for research, technical education and technical development. Much justification for a great deal of level tendering in the past was that the money obtained from it had provided vast sums for research. It would be disastrous if these heavy industries had to give up research on big machines, whether it was for gas turbine work, electrical engineering or atomic energy.

Sir Hugh Linstead said paragraph (b) was singularly badly designed to deal with research, education and development. It referred to "purchasers, consumers or users"—not to the public generally—and then used the words "of any goods." That seemed to cut out entirely services such as electricity or other forms of energy. To allow this plea to be made in respect of goods, and not for a number of other industrial services or processes, would deny a section of industry the benefits they should have under paragraph (b).

Mr. Thorneycroft, when he replied, did not refer to the point made by Sir Hugh Linstead.

The amendment was negatived.

A Government amendment allowing the court to decide that a restriction is not unreasonable, having regard to the balance between the benefits of a restriction and any detriment to the public likely to result, was approved.

E.T.U. CONFERENCE

Automation and Employment

THE annual delegate conference of the Electrical Trades Union opens next Monday at Hastings and continues until Friday. Of a full agenda of 171 motions, many with amendments, more than two-thirds deal with industrial and trade subjects.

The sixteen motions on the electrical contracting industry are of varied significance and importance. Two call for a five-day week, one stipulating that it must be one of forty hours. Only two are concerned with wages. The first, a composite, points out that in many industries base rates are minima to which are added various payments. Wage packets, the sponsors claim, are larger in these industries, and to make good the difference the Executive Council is called upon to press "with the utmost vigour for a substantial increase for all electrical contracting workers." The other motion refers to "abortive negotiations" and "arbitration courts." It wants "a complete overhaul of the negotiating machinery" and the word "minima" inserted in all future agreements.

Because of failure to negotiate a sick pay scheme with the National Federated Electrical Association, two motions on the agenda of the conference suggest that the Union should introduce a scheme of its own.

No demand is made for an immediate substantial increase of wages in the electricity supply industry. Five motions express dissatisfaction with the position of junior labour and apprentice training. A composite motion wants parity in sick pay, holidays and superannuation with the clerical and administrative grades. A Manchester resolution urges the Executive Council to press for the introduction of legislation to provide adequate safeguards for the protection of all workers employed in atomic power stations.

Under the heading of "Electronics" there is a request for the initiation and/or extension of apprenticeship and training schemes for young entrants to what is called "the fast growing electronic manufacturing field." A composite motion calls for an extensive recruiting campaign, and a further composite motion urges "immediate steps . . . to institute a national wages structure for the electronic industry."

Five motions on automation express fear of the effects of automation on employment and working conditions. One "demands that the trade union movement, from the top to the workshop floor, shall have a say in its general application in order to protect the working conditions and future livelihood of its members."

Harlow calls on the Executive Council (1) to initiate the most widespread campaign to recruit all women workers in the industry on the basis of the fullest explanation of the effects on their employment of automatic techniques; (2) to take special steps to recruit all technical personnel engaged on the installation and maintenance of automation equipment. A London motion asks "that Parliament should set up a permanent committee to study the needs and effects of automation and electronics in industry and agriculture, and that the committee should be drawn from a wide range of trade unions, employers' organisations, the nationalised industries and technical bodies." Another London motion wants negotiations with the Labour Party and the Trades Union Congress . . . "to form and constitute a sub-committee to investigate the fundamentals of automation."

Other motions on the agenda call for the nationalisation of the aircraft industry, building and building materials industries, engineering and shipbuilding industries, and iron and steel.

Under general subjects, a motion expresses "extreme concern at the present Government's attempts partially to solve Britain's crisis by the fiscal measures of raising the bank rate, cutting housing subsidies, restricting credit and forcing local authorities to borrow on the money market."

The Executive Council's report to the conference records a 3·7 per cent increase in membership (from 215,596 in December, 1954, to 223,602 in December, 1955).

VIEWS on the NEWS

By REFLECTOR

FROM every direction there come communications deprecating very strongly the deterrent effects on enterprise of to-day's punitive taxation. Writing to the *Sunday Times*, Mr. E. Manfred attributes part of the shortage of technologists to this cause. He says that, financially, there is little future for such men; any future increases in salary which they may hope to get, although apparently satisfactory, will be entirely negatived by taxation. Mr. Manfred mentions two technologists who have left this country for more hopeful fields. He says that while we are complaining of a lack of technologists and the Government is prepared to spend large sums on technological training, the result of our system "can only be that we shall be a training ground for technologists at the taxpayer's expense, retaining only the less brilliant while exporting the more brilliant."

* * *

In the B.B.C. services no opportunity is lost of boosting entertainers and entertainments of all kinds. Plays and films, stage and film actors, singers and their songs, and particularly their gramophone records, are blatantly "plugged" *ad nauseam*. Books and their authors and publishers are selected and "pushed" and there are many more subtle advertisements. Yet when industrial concerns accomplish notable feats of production, especially for the export field, they are invariably hidden under such descriptions as "a leading engineering firm" or "a well-known electrical concern." On television great care is taken to see that the cameras steer clear of name-plates, although there are occasional inadvertencies. I am of the opinion that great industrial achievements and notable export contracts earn national recognition and the B.B.C. should give it to them.

* * *

That no reliable news ever comes from behind the "Iron Curtain" has become almost a platitude; certainly there has been a scarcity of reliable information electrically for a long time. The address on "The Soviet Power Industry" by Mr. G. M. Malenkov, Minister of Power Stations of the U.S.S.R., reported in the *Electrical Review* of 27th April, seems to me, however, to be a very reasonable account of the trend of the electricity supply industry in Russia. The increase in electricity output from 2,000 million kWh in 1913 to 48,000 million kWh in 1940 was no small achievement, but the outpacing of this rate of progress to 90,000 million kWh in 1950 and to 170,000 million kWh in 1955 is really remarkable, as is the estimated output of 320,000 million kWh in 1960. The building of hydro-electric stations with a total capacity of more than 20 million kW during a five-year period also spells intense progress and the 800,000 kW hydro-electric station mentioned in particular is an outstanding example of modern Russia's determination to do things in a big way. The trend in the development of thermal power stations is almost equally notable, with stations approaching the million kilowatt capacity mark and turbo-alternator sets of up to 300,000 kW contemplated. Steam conditions of up to 4,000 lb/sq in and 1,200 deg F suggest that they are rather ahead of us in this country but probably on a par with developments in the U.S.A. With the great distances across the U.S.S.R. territories it is a courageous act to attempt the establishment of an overall grid linking up the area grids which have or are being formed.

* * *

A reader has sent me a cutting from the *South London Press* referring to the conversion of street lighting in Wandsworth. Under the heading of "New Light System is Big Saver" it says that sodium street lighting is so much cheaper than electric or gas lighting that it would be better to change to the system as soon as possible despite the need for cutting down capital spending. "Who is holding up all the information regarding developments in street lighting other than by means of electricity or gas?" asks my correspondent. Sodium lighting may not be considered by some as electric lighting but perhaps that is better than the former confusion of "gas-discharge" lighting as a system of gas lighting.

* * *

I am indebted to the *Belfast News-Letter* for the information that the Belfast Gas Committee has reported that it recently

> "accepted the lowest of three tenders received in response to public advertisement for alterations to four electric lifts, subject to 'rise and fall' clause."

* * *

Fifty years ago a White Paper was published relative to the likelihood of a great smoke nuisance from possible power stations that might be built in connection with the London electricity supply undertakings. Discussing the matter the *Electrical Review* of 11th May, 1906, said:

> "Every engineer knows that with proper furnaces there is no need to make smoke; yet few of them make the slightest attempt to deal rationally with the problem of combustion. Boilers are put down and the furnaces prove a failure, as an inspection of the drawings would have foretold. Then comes the period of tinkering with nostrums and mechanical stokers, which at present seems to end in the adoption of chain grates with several hundreds per cent air excess and a CO_2 ratio of 2 per cent or very little more."

After dealing with the fears of the Commissioners of Works about the effects of grit and sulphur upon the gardens and parks in their charge the *Review* went on to say:—

> "In the appendix to the White Paper are letters from Sir A. B. W. Kennedy and Dr. T. C. Thorpe. The former says there is no sulphur in Welsh coal; the latter says there is, and quite disposes of Sir Alexander Kennedy's contention that his Grove Road chimney actually benefits plant life because it turns out CO_2."

NEW ELECTRICAL EQUIPMENT

Rotary Switch

A new multiple circuit rotary switch has been brought out by CRATER PRODUCTS, LTD., The Lye, St. Johns, Woking, Surrey. This has been designed to enable a wide variety of circuits to be controlled by one switch and consists essentially of six change-over contacts of the silver button type. Operated by a carefully timed arrangement of cams, certain standard arrangements of circuits are provided but it is possible for users to evolve switching circuits to their own requirements from a knowledge of the contacts available.

Wash Boiler

A 4½ gal wash boiler has been introduced by the DARLASTON GALVANISED HOLLOWARE CO., LTD., Wednesbury, Staffs. Marketed under the brand name of "Red Label," it employs a "Tetra" 2 kW element and an automatic cut-out is provided. It has a bright galvanised finish and the price is £3 19s 6d.

Air-flow Space Heater

A compact thermostatically controlled heater, with varying heat outputs, has recently been placed on the market by P. W. BAKER & SONS (SALES), LTD., Mayhurst, Maybury, Woking, Surrey. This new "Mayhurst" air-flow space heater has fan assisted convection, automatic temperature control, three separate heat outputs (2,500, 1,600 and 900 W), a summer cooling device, automatic restarting cut-out, and a pilot light.

The overall diameter is 10½in and the height 11in. It is finished in hammered gilt with black louvres and the total weight is 10½ lb. Voltage ranges are 200/225 and 225/250, a.c., and it is fully suppressed and quiet in operation. The price is £11 19s 10d plus £5 5s 2d purchase tax in the United Kingdom.

Aluminium Conductor Fittings

A complete range of simplified line fittings for aluminium and aluminium alloy conductors is announced by CABLE COVERS, LTD., St. Stephen's House, Westminster, S.W.1.

These fittings include a new fully automatic mid-span connector suitable for a wide range of these conductors, its design resembling the well-known CCL connector for copper conductors. Also in production are universal terminating clamps. Type BS/AU—a light line fitting—incorporates low cost interchangeable alloy cone joints for conductors up to 0·05 sq in copper equivalent. The heavy line, or Mk.1/AU clamp, also possesses this feature in the alloy range of 0·06 to 0·10 sq in and 0·15 to 0·2 sq in copper equivalent. Included in these new productions are alloy type line connectors for conductors up to 2 × 0·1 sq in copper equivalent.

It is stated that this range of fittings has successfully withstood rigorous tensile, electrical, corrosion and vibration tests.

Other equipment for line transmission work includes stay rods, stay clamps, earth rods, come-along tongs and running out blocks.

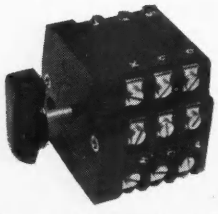
Wave Pulse Generator

A new wave pulse generator known as the "Sonomec" energy generator has been produced by D.F. DEVELOPMENTS, LTD., 175, Piccadilly, London, W.1. This is primarily intended for use in laboratories where high standards are demanded and is a mechanical vibrator with great variability within the frequency range of 0-200 c/s per second. It consists essentially of a mechanically driven disc diaphragm transmitting vibrations to either liquids or solids placed in the one-gallon capacity processing pot of the apparatus. The linkage mechanism is driven by a 2 h.p. electric motor incorporating a means of adjusting the amplitude of vibration in an infinitely variable manner. Frequency also can be varied without stopping the machine.

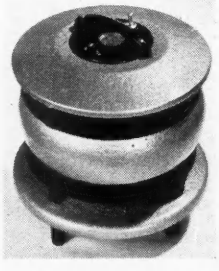
Circular Saw Attachment

A 6in portable circular saw attachment, the "Nu-Rip," has been introduced by S. N. BRIDGES & CO., LTD., Parsons Green Lane, London, S.W.6, as an accessory to their "Toolpower" home workshop range.

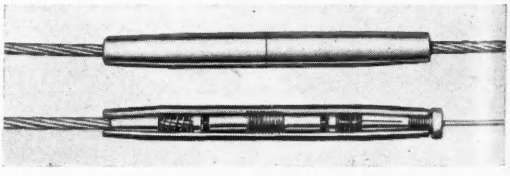
Of die-cast alloy construction, the saw is capable of ripping or cross-cutting timber 1½in thick, and the mitring gauge is calibrated in single degrees up to 45 deg. It has a rise and fall table for depth of cut with an adjustable rip fence which can be



Crater multiple circuit switch

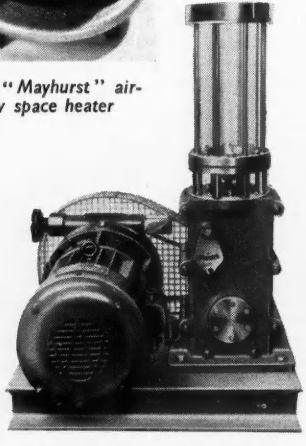


Baker "Mayhurst" air-flow space heater



CCL mid-span connector for s.c.a. conductors

Darlaston "Red Label" wash boiler



"Sonomec" wave pulse generator

Bridges circular saw attachment

used on either side of the machine. A retractable saw guard automatically covers the blade when the cut is completed.

The price is £4 19s 6d, inclusive of a combined rip and cross-cut blade, or £4 3s 6d excluding the blade.

Heat-treatment Furnace

A vertical loading furnace for the bright annealing of non-ferrous metals, the blueing of steel tools and the normalising of castings, etc., has been introduced by HEDIN, LTD., Commerce Estate, South Woodford, London, E.18. The furnace incorporates an automatic steam atmosphere container which provides a cheap protective atmosphere for the heat treatment of non-ferrous metals, particularly for beryllium copper and the solution treatment of aluminium. The furnaces cover a capacity range from ½ cwt to 2 tons.

Fluorescent Diffusers

Two new fluorescent diffusers for twin-lamp operation have recently been added to the "Mazda" range of fluorescent fittings manufactured by the BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, London, W.C.2. Both are interchangeable on the standard B.T.H. power pack.

These diffusers hang on to a lipped channel cover plate and can be allowed to hang freely from either side for maintenance, or they may be completely removed for cleaning. All metal external surfaces are stove enamelled white on both fittings.

The F1237 has a metal honeycomb louvre with two winged side panels of ½in reeded opal "Perspex," curved back at the outer edges, and the F1238 has a one-piece diffuser of reeded "Perspex," with plain sheet metal end-pieces.

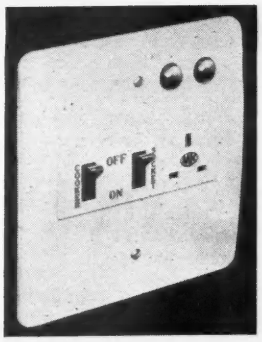
The fittings, complete with switch-start auxiliary gear, are priced at £24 12s 8d (F1237) and £23 13s 8d (F1238) plus £3 19s 3d and £3 15s, respectively, for purchase tax in the United Kingdom. Instant start patterns are also available.

Fluorescent Inspection Lamp

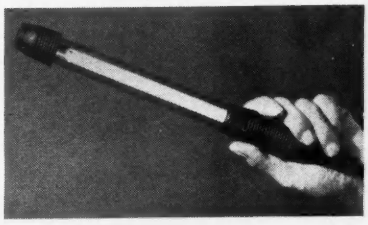
SIR THOMAS EDELSTON & PARTNERS, LTD., 28-30, Sussex Place, London, W.2, are putting on the market the "Step" fluorescent inspection lamp which is said to be a nearly unbreakable means of portable lighting. A 6 W tube is used and the lamp has an overall length of 12in, a diameter of 1¼in and a weight of 9 oz. No choke or control gear are required. The tube is completely enclosed in a strong "Perspex" cover with rubber cushioning and is supplied with p.v.c. covered cable. The price, including a spring clip for suspension, is 66s.

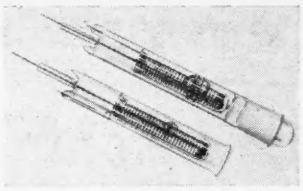
Auto-Timer for Cookers

An attractively styled, wall mounting auto-timer which gives full time control of thermostatically controlled ovens in all types of domestic electric cookers has been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. By means of a synchronous clock it will control cooking in the oven over a maximum period of up to twelve hours. A 25 A control switch mechanism with every facility for easy wiring is provided. Supplied in honeysuckle or white porcelain enamel, the overall dimensions are 7in wide by 5½in high by 4in deep (including control knob). It is available for 200/250 V a.c. and the price is £5 10s.

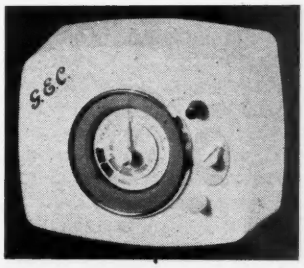


M.K. cooker control unit





Two of the new Mullard Geiger-Muller tubes for liquid canning applications



Above: G.E.C. wall mounting auto-timer

Left: The "Step" inspection lamp

Geiger-Muller Tubes

Two new types of Geiger-Muller tubes have been produced by MULLARD, LTD., Century House, Shaftesbury Avenue, London, W.C.2. These are of interest because of their extremely long lives (minimum number of counts 10,000 million) and by reason of their mechanical robustness and standardised working voltage. One tube is of the mica end window type with a very thin mica window suitable for measuring low energy radiation; and the other is a liquid sample tube of conventional design available with or without a ground glass stopper.

Wellglass Handlamp

It is announced by the BRITISH CENTRAL ELECTRICAL CO., LTD., 6 & 8, Rosebery Avenue, London, E.C.1, that they have recently redesigned their wellglass "Gripper" handlamp, simplifying its structure and making for easy assembly and dismantling.

The new construction dispenses with the grub screws which used to house the ring retaining the wellglass in position. This cover is now removable very simply by hand by unscrewing it, and no screwdriver or other tools are necessary. The lamp can thus be inserted or replaced in a few seconds. This modification also enables a really tight fit to be made by the clamping action of screwing down the cover retaining ring until the rubber pad fitted between the wellglass and the base of the hand-lamp is under pressure.

Cooker Control Units

A new range of cooker control units is now available from M.K. ELECTRIC, LTD., Wakefield Street, Edmonton, London, N.18. These have been re-styled and are finished in ivory stove enamel with the switch handles moulded in red. The range consists of surface and flush units including either a 13 A or a 15 A auxiliary circuit. All types are available with or without pilot lamps. In the flush units adjusting screws are provided to enable the interior to be raised or lowered allowing for considerable variations in plaster thickness.

Solderless Wire Connectors

A range of thimble type, solderless wire connectors is now being marketed under the trade name "Hi-Scale" by FITZGIBBON & MURRAY, LTD., Lower Mill, Ewell, Surrey.

The connector, which is of black Bakelite material, is provided with deep grooves on the outside of the moulding to ensure a good finger grip. A slightly conical steel spring insert is incorporated into the thimble and this twists the connectors together simultaneously. The insert is copper plated to assist in the formation of a conducting path. They are available in various sizes to accommodate most gauges of solid or stranded connectors.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Railway Modernisation

REFERRING to Mr. J. Faulkner's suggestion (*Electrical Review*, 20th April) that comparatively lightly-used branch lines should be electrified: the resources of capital, manpower and equipment are manifestly inadequate to allow the electrification of the entire railway system to be undertaken simultaneously. The 15-year Modernisation and Re-equipment Plan provides for the maximum amount of electrification that appears to be practicable within that period, and it is surely better that lines where traffic is heaviest and where the maximum benefits can be derived should be electrified first.

There is no suggestion that finality will be reached with completion of the present plan. In fact, the British Transport Commission's recent announcement of the intention to adopt the 50 c/s a.c. system included the statement that "they consider that the system will permit the electrification in the future of some secondary lines on which electrification by the d.c. method could not be justified," while the published booklet on the Plan describes diesel traction as "a half-way house to electrification" (p. 16, para. 50).

London, N.W.1. J. H. BREBNER,
Public Relations Adviser,
British Transport Commission.

Carron Oil for Burns

INTERESTING as I find "Reflector's" comments in the *Electrical Review* of 27th April on the origin of the name for this oil, and details of its present (?) make-up, I feel any first aiders reading the note will be horrified.

May I ask you to publish this letter, pointing out that carron oil is no longer recognised by first aiders or the medical profession as being in any way suitable for treatment of burns, early or late? First aid application of any oily or greasy material is no longer given in St. John or Red Cross textbooks, being replaced by application of dressings soaked in solution of sodium bicarbonate (baking soda), two teaspoons to the pint.

Subsequent hospital treatment is considerably impeded by carron oil and serious scarring and disability may be the result of its use, particularly on those very vulnerable points, the hands and face.

Bath. J. KENARD,
First Aid Team Member,
British Electricity Ambulance Centre,
South Western Electricity Board.

Are Standards Lower?

I READ with interest Mr. L. R. Turner's letter in your issue of 27th April. The expansion in the use of electrical equipment each year is so great that it is only to be expected that most of the equipment seen is comparatively modern, but that does not mean that it will fail to give good service over very lengthy periods.

Through your journal I should like to extend an invitation to Mr. Turner to come to Chelmsford to see the Crompton Historic Collection. In the Collection will be seen many motors and generators in the ½ to 30 h.p./kW range, circuit-breakers and instruments which have given 50, 60 and even more years of actual service on users' premises and which are still in excellent condition. Brief histories of the items and names of users will be supplied.

It is noticed that Mr. Turner writes from Birmingham. Presumably he could not have been aware of the four 7¾ h.p. 600/900 r.p.m. d.c. motors which were installed in Birmingham General Hospital and which were in continuous operation from the time the hospital was opened by Queen Victoria in 1897 until the supply was changed to a.c. about eighteen months ago. They were part of the plenum system of ventilation which provided warm air in the winter and cold air in the summer. The motors were driving ventilating fans and were operating 24 hours per day, seven days a week. One of the motors is now at Chelmsford and may be seen.

In case the above items should be considered as "heavy" equipment, it may be of interest to know that in 1907 my company supplied to Singapore Cricket Club six 56in ceiling fans, each taking only slightly more than 60 W. From that time and right through the Japanese occupation they gave excellent service. Five of them are still in operation at the club; the sixth is still in first-class condition but has been returned to Chelmsford for the Collection.

In the Historic Collection are also electrical domestic appliances manufactured in 1891 with several decades of active service to their credit.

I hope the above examples will help to convince Mr. Turner that high standards of workmanship have been embodied in the electrical industry in the past and, at least in some sections, are embodied now.

Chelmsford. A. V. SOWMAN, M.I.E.E.,
General Manager,
Chelmsford Works,
Crompton Parkinson, Ltd.

MR. L. R. TURNER, who says "one looks in vain" to find veteran electrical equipment in service, has evidently not looked in the right direction.

Quite a number of machines manufactured by this company fifty years and even more ago are still working and no doubt the same is true of other old established makers of rotating machinery.

Perhaps Mr. Turner has forgotten that the majority of the really old machines were swept away at the time of the change-over to alternating current.

London, W.C.2. T. J. BARFIELD,
Publicity Manager,
Laurence, Scott & Electromotors, Ltd.

Earth Loop Testing

WITH reference to Mr. Cubitt's letter in your issue of 27th April, may I make the following comments:—

(1) It is obvious that the instrument I have suggested does not simulate fault conditions, but neither do those which inject a current at a low voltage.

(2) The voltage drop in the neutral, or rather the phase conductor, is present during fault conditions, but this is no argument for ignoring it in carrying out a test. During a fault the full phase voltage of, say, 230, is available to create a current through the loop, and an existing voltage drop of 5 to 10 due to other consumers is not important. It is important during a test, when the test voltage is not to exceed 40, and the errors introduced could easily lead to the rejection of a good loop or the acceptance of a bad one. I do not think that in these circumstances the

elimination of error due to this cause can be considered a questionable refinement.

(3) The current of 3 A is lower than one would desire, but this is dictated by the power available from a hand generator.

(4) As regards steel conduit, it is known that this possesses inductance, but steel conduit forms only a small part of any complete loop, and the point I am making is that the difference between the resistance and impedance of an earth loop is not sufficient to make it essential to measure the impedance, rather than the resistance.

(5) I do not see the basis of the final remark that it is fundamentally unsound to measure with a comparatively low value of reversed direct current. The final design of the instrument was not decided upon until careful consideration had been given to all aspects of the problem and considerable experimental work carried out.

London, W.4.

G. F. TAGG, B.Sc., Ph.D., M.I.E.E., F.Inst.P.,
Chief Research Engineer,
Eversheld & Vignoles, Ltd.

We regret that the first letter in this section in our last issue ("Copper versus Aluminium") bore the signature "Stanley F. Price"; the letter was actually signed Stanley F Rice.—*Editors.*

Short-Circuit Testing

A.S.T.A. to Extend Certification Range of Non-Members' Equipment

IT was in 1929 that the first short-circuit testing station was established and later others were opened. These were primarily designed for research and development but it soon became clear that it was necessary to specify conditions of testing and with the co-operation of the various testing stations B.S. 116 : 1937 for oil circuit-breakers was formulated; this formed the basis of an internationally recognised standard specification—I.E.C. No. 56 : 1937.

Having achieved a testing standard the testing authorities realised the need for a common interpretation of the standard and uniformity of testing procedure. It was this which was an important contributory factor to the formation, in 1938, of the Association of Short-circuit Testing Authorities. Originally membership of A.S.T.A. was confined to companies operating short-circuit testing stations but other switchgear makers approached the Department of Scientific and Industrial Research with a request that a national testing station should be established. Members of A.S.T.A. indicated to the D.S.I.R. that they were prepared to operate a scheme, open to non-members, to provide short-circuit testing facilities at their stations up to 11 kV and 250 MVA. By agreement with the D.S.I.R. the scheme was inaugurated and made available to electricity supply authorities and British manufacturers. The National Physical Laboratory undertook to appoint an observer at each testing station to witness all certification tests and satisfy himself that all the proper conditions were observed. The scheme proved very successful and the possession of an A.S.T.A. certificate of rating has become a requirement of most purchasers of switchgear.

Tests up to 33 kV and 750 MVA

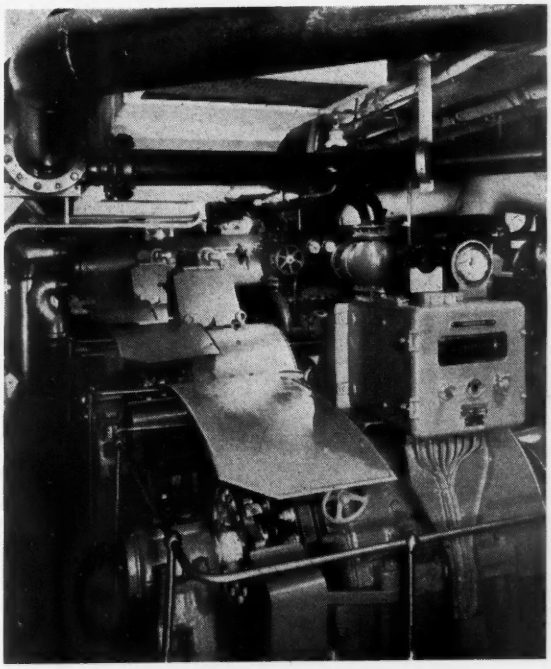
Increases in distribution voltages and MVA ratings since 1938 forced British manufacturers without their own testing stations to seek testing and certification abroad. The Association considered this to be damaging to British prestige and consequently it has decided to raise the range of testing for certification of non-members' equipment to 33 kV and 750 MVA. This decision was taken in the face of the fact that the member companies' research and development programmes have been very heavy and the allocation of capacity to non-members has sometimes been difficult.

Moreover the provision and operation of a short-circuit testing station for h.v. switchgear are very costly and a decision had to be made upon the scale of fees to be charged to non-members. Already existing fees were uneconomic but it was realised that if manufacturers were to be encouraged to go to A.S.T.A. for certification tests the charges would have to be reasonably comparable with those made, for example, at the K.E.M.A. in Holland, which is State-subsidised. Accordingly it was decided to base charges to non-members on the normal tariff to members.

It is believed that the Association's decision will be of service not only to the manufacturers themselves but to electricity supply undertakings both at home and overseas and will be in the best interests of the United Kingdom. The chairman of the A.S.T.A. Council is Col. B. H. Leeson, C.B.E., and Mr. J. R. Wilkinson is chairman of the Management Committee.

'Empress of Britain'

IN our 27th April issue we published a description of the electrical installation in the Canadian Pacific Railway Company's latest passenger liner, the *Empress of Britain.* The accompanying photograph shows three 210 h.p. motors, manufactured by Laurence, Scott & Electromotors, Ltd., driving compressors for the liner's very extensive air-conditioning system.



210 h.p. motors driving compressors for the air-conditioning system of the "Empress of Britain"

PERSONAL AND SOCIAL

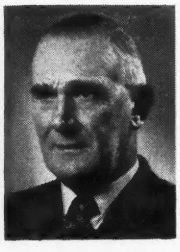
News of Men and Women of the Industry

The Hon. Geoffrey Cunliffe was elected president of the Aluminium Development Association at the annual meeting held on 20th April. The new vice-president is **Mr. Spence Sanders** (Almin, Ltd.), and **Mr. J. H. Mayes** (Northern Aluminium Co., Ltd.) succeeds **Mr. H. Goodwin** as chairman of the Executive Committee.

Mr. Cunliffe has had two previous terms as president (in 1945-46 and 1947-48). He is deputy chairman and joint managing director of the British Aluminium Co., Ltd., and chairman of the Aluminium Corporation, Ltd., and the Aluminium Wire & Cable Co., Ltd.

Mr. Ernest Moor, works manager of the Engineering Department of W. T. Henley's Telegraph Works Co., Ltd., Gravesend, retired on 21st April. Mr. Moor joined Henley's in 1911 as a draughtsman in the Engineering Department, Gravesend, and in 1917 he became chief draughtsman. He was appointed to his present position in 1919. Mr. Moor has also been associated with Oakley Brothers, Ltd., a subsidiary company of Henley's,

Mr. E. Moor



Mr. H. W. Breeze

and he will continue in a consultative capacity in connection with this company.

Mr. Moor is succeeded by **Mr. H. W. Breeze,** A.M.I.E.E., who has been assistant works manager, Engineering Department, since 1951. Mr. Breeze was educated at Birmingham Technical College and commenced with Henley's in 1918 as a draughtsman in the Engineering Department, Gravesend, being promoted to chief draughtsman in 1925. He has served on B.S.I., B.E.A.M.A., C.M.A. and other technical committees.

The British Transport Commission has appointed **Mr. W. S. Taylor,** acting distribution engineer, Manchester, as distribution engineer (deputy electric traction engineer), Chief Mechanical and Electrical Engineer's Department, Eastern Region, Manchester London Road.

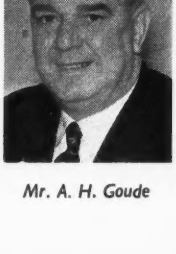
Mr. Taylor entered the service of the former L.N.E.R. as a premium apprentice in the Chief Mechanical Engineer's Department at Doncaster and later was in the traction drawing office of the chief electrical engineer at King's Cross. In 1946 he was appointed technical assistant at King's Cross and was engaged chiefly on design and planning work in connection with the Liverpool Street/Shenfield and the Manchester/Sheffield/Wath electrification schemes. He became outdoor assistant at Penistone in 1950 in charge of installation work on the Eastern Section of the Manchester/Sheffield/Wath scheme, under the resident electrical engineer, and in 1951 he was appointed substation and track inspector at Penistone. Mr. Taylor has been acting distribution engineer for the Manchester/Sheffield/Wath lines since August, 1955.

Mr. P. Ross has joined the Benjamin Electric, Ltd., as assistant to Mr. G. O. Bateman, who controls the Government and Railways Department of the company. Mr. Ross will principally operate in the North of England and Scotland. He was previously with the United Kingdom Atomic Energy Authority, where his duties involved the design of lighting and power installations for the various atomic energy factories.

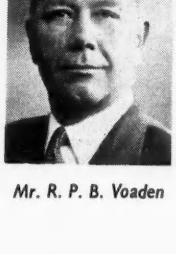
The A.E.I. Lamp & Lighting Co., Ltd., announces the appointment of **Mr. A. H. Goude** as manager of head office sales. His responsibilities include the supervision of lamp and lighting sales to Government Departments and the Railways. He joined the B.T.H. Coventry Works in 1914 and has been successively manager, lamp and lighting sales, in Plymouth, Birmingham and the South of England between 1940 and 1949. He was in charge of lamp and lighting sales in the provincial area between 1949 and 1955.

New regional appointments are **Mr. R. P. B. Voaden,** A.M.I.E.E., as manager, Midland Region, and **Mr. G. W. Nattrass,** as manager, North East Region.

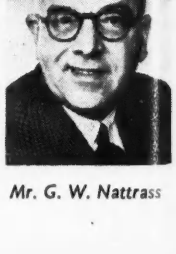
Mr. Voaden joined the B.T.H. Co. as an apprentice in 1917. Between 1933 and 1949 he was an estimating engineer, then a plant and power engineer at the Birmingham office. After spending a period at the Cambridge office, he returned to Birmingham as assistant manager and became assistant district manager in 1954.



Mr. A. H. Goude



Mr. R. P. B. Voaden



Mr. G. W. Nattrass

After serving with Metropolitan-Vickers Supplies, Ltd., in Sheffield, Mr. Nattrass joined the Edison Swan Electric Co., Ltd., in 1930 as a salesman in the Teesside area. He was appointed Newcastle district manager in 1949.

Mr. P. B. H. Cuff has been appointed a director of Solartron Electronic Business Machines, Ltd. He joined the staff of the Solartron Electronic Group, Ltd., as group controller of purchasing and stores in August last.

Mr. A. E. Woollaston, Associate I.E.E., previously manager for Pakistan for Johnson & Phillips, Ltd., has returned to this country to undertake new duties at the company's head office, mainly in connection with liaison between the home and overseas factories. Mr. Woollaston, who joined J. & P.'s Bombay staff in 1945, opened the branch in Karachi in 1948, and subsequently established the factory there. **Mr. J. H. L. Buckley,** deputy manager for J. & P. in Karachi, has succeeded Mr. Woollaston as manager for Pakistan. Before joining J. & P. in 1953 Mr. Buckley was with Forbes, Forbes, Campbell & Co., Ltd., in Karachi, after earlier experience with Laurence, Scott & Electromotors, Ltd., and the Metropolitan-Vickers Electrical Co., Ltd.

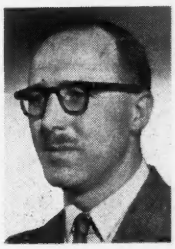
Mr. A. E. Woollaston

On 1st March the Metropolitan-Vickers Electrical Co., Ltd., appointed **Mr. L. S. Robson,** M.C., M.Sc.Tech., M.I.Mech.E., to be assistant chief mechanical engineer. He has been chief engineer, Steam Turbine Engineering Department, since 1944. Other appointments made on the same date were **Mr. D. M. Smith,** F.R.S., D.Sc., M.I.Mech.E., F.R.Ae.S., previously chief engineer of the Gas Turbine

Mr. L. S. Robson

Dr. D. M. Smith

Mr. J. S. Hall


Dr. W. H. Darlington

Mr. J. V. Bigg

Engineering Department, as chief engineer, Mechanical Engineering Development; **Mr. J. S. Hall,** B.Sc.Tech., A.M.I.Mech.E., formerly assistant chief engineer, Steam Turbine Engineering Department, as chief engineer of that department; **Mr. W. H. Darlington,** M.B.E., Ph.D., M.Sc.(Eng.), A.C.G.I., D.I.C., A.M.I.Mech.E., A.F.R.Ae.S., formerly chief engineer, Condenser and Gear Engineering Department, as chief engineer, Gas Turbine and Gear Engineering Department; and **Mr. J. V. Bigg,** M.A., A.M.I.Mech.E., A.M.I.Mar.E., previously assistant chief engineer, Condenser Engineering Department, as chief engineer, Condenser and Heat Exchange Engineering Department.

Mr. J. W. Grieve, B.Sc., M.I.E.E., who has been appointed assistant electrical engineer (new works), Chief Mechanical and Electrical Engineer's Department, Eastern and North Eastern Regions, British Railways, was educated at Bradford Grammar School, Edinburgh University and Heriot-Watt College, Edinburgh. After pupilage with the Metropolitan-Vickers Electrical Co., Ltd., at Manchester and Sheffield, he was appointed to the company's Traction Erection Department in London. In 1926 he was appointed assistant electrical engineer on the Bombay-Baroda and Central India Railway for the inauguration of the electric suburban services in Bombay. He entered the service of the L.M.S.R. in 1930, becoming assistant (electric traction) to the chief mechanical and electrical engineer, London Midland Region in 1949. In 1950 Mr. Grieve was appointed assistant (schemes and calculations) in the newly formed electrical engineering new works and development section of the Railway Executive and in 1951 was made electrification engineer, responsible to the executive officer, electrical engineering new works and development section, British Transport Commission, for electrification schemes in the Eastern and North Eastern Regions. Mr. Grieve has been concerned in particular with the modernisation of the Tyneside electrified lines and the extension of the Shenfield electrified lines.

Mr. J. W. Grieve

Mr. C. G. Hancock, A.M.I.E.E., assistant labour relations officer at the Central Electricity Authority's headquarters, has been appointed a deputy labour relations officer at headquarters in succession to **Mr. G. W. Essex,** who retired on 31st March. Mr. Hancock, who received his technical education at the Staffordshire County and Wolverhampton Technical Colleges and early training with the Midland Corporation for Power Distribution, Ltd., joined the Hull Corporation Electricity Department as a test room assistant in 1930, subsequently becoming an assistant mains engineer. In 1946 he was appointed assistant secretary of the Electrical Power Engineers' Association. When the electricity supply industry was nationalised, Mr. Hancock became labour relations officer of the North Western District and took up his present appointment in August, 1950.

Mr. G. M. Holland, A.M.I.E.E., A.M.I.I.A., has been appointed engineer to the Fens Sub-Area of the Eastern Electricity Board, in succession to the late Mr. A. C. Eden, B.Sc., M.I.E.E. On completion of his apprenticeship with the Croydon Corporation Electricity Department in 1934, Mr. Holland held various appointments with that undertaking and was assistant distribution engineer before his appointment as technical assistant in the Peterborough Corporation Electricity Department in 1947. When the industry was nationalised in 1948 Mr. Holland was appointed senior assistant engineer (planning and development) at the Fens Sub-Area headquarters and he relinquishes that position in order to take up his new appointment.

In our advertisement pages to-day the Government of Victoria, Australia, invites applications for the position of chairman of the State Electricity Commission of Victoria. The maximum salary is £A6,000 per annum. The present chairman, **Mr. R. A. Hunt,** D.S.O., is retiring in August.

Mr. C. W. Haycraft, who has been technical representative in the London Electricity Board area for the Jackson Electric Stove Co., Ltd., has been appointed Birmingham branch office manager in succession to **Mr. K. A. Aldridge,** who resigned from the company at the end of last month. **Mr. D. C. Bradbury** will continue to operate as technical representative in the East Midlands Electricity Board area and, as before, will be attached to the Birmingham office.

Mr. D. C. Lorkin, F.C.I.S., a director of Lancashire Dynamo Holdings, Ltd., and joint managing director of Lancashire Dynamo & Crypto, Ltd., has become chairman of Crypto, Ltd. **Mr. J. Parry,** formerly a director and general manager of the Crypto Co., has been appointed its managing director. **Mr. J. G. Shaw** retains his seat on the board in a non-executive capacity.

Mr. D. C. Lorkin

Mr. R. Telford, general works manager of Marconi's Wireless Telegraph Co., Ltd., has been selected as a group chairman of one of the Groups of the Study Conference on the Human Problems of Industrial Communities within the Commonwealth and Empire, to be held in Britain this summer under the presidency of the Duke of Edinburgh.

Powell Duffryn Technical Services, Ltd., announce that **Mr. R. Turner,** M.I.Mech.E., A.M.(S.A.)I.E.E., has been appointed chief engineer. Mr. Turner obtained his initial experience with Belliss & Morcom, Ltd., whom he joined in 1924 and by whom he was employed from 1931 to 1939 on the erection, repair, testing and commissioning of steam turbo-alternator plants, etc., in industrial undertakings and power stations in the United Kingdom and overseas. In 1939 he joined De Beers Consolidated Mines, Ltd., first as assistant superintendent of Kimberley power station, and subsequently, in

Mr. R. Turner

1947, he became resident engineer. Mr. Turner will be taking up his duties with Powell Duffryn Technical Services in June.

Mr. C. H. Alsop, publicity manager of W. H. Allen, Sons & Co., Ltd., has been elected chairman of the Publicity Committee of the British Electrical and Allied Manufacturers' Association. Mr. Alsop is a member of the Publicity Committee of the British Engineers' Association and of the joint B.E.A.-B.E.A.M.A. Committee.

Mr. L. Hart, publicity manager of the Brush Electrical Engineering Co., Ltd., Loughborough, has been elected vice-chairman of the Publicity Committee of B.E.A.M.A. He has been a member of the committee for eleven years.

In our last issue we reported that **Mr. P. B. Etheridge** had been appointed as director and secretary designate of the Electrical Wholesalers' Federation with effect from 22nd May, and we now reproduce his portrait.

Mr. P. B. Etheridge

Mr. S. R. Horn has been appointed by the Yale & Towne Manufacturing Co. as area sales manager for Yorkshire and the North Eastern Counties. Mr. Horn has been employed on the sales side in the fork lift truck industry and has concentrated in particular on the whole of the heavy industrial areas in England and Wales.

Mr. C. J. King, B.Sc.(Eng.), A.M.I.E.E., has been appointed to the newly-created position of Midlands area manager of Lumenated Ceilings, Ltd. Until suitable showrooms are obtained in the Midlands, he can be communicated with through the Birmingham Engineering Centre and Exchange, Stephenson Place, Birmingham (telephone: Birmingham Midland 1914). For the past five years Mr. King has been in private practice as a consulting engineer, and editor of the *Scottish Electrical Engineer*. He has an extensive knowledge of lighting, having served as an area engineer for the Lighting Service Bureau of Scotland.

Noel Coward's well-known comedy, "Blithe Spirit," was presented by **The Portland Players** (Central Electricity Authority Sports and Social Club) at Portland Hall, London, on Thursday and Friday last. This dramatic society has established a reputation for its excellent performances, and this latest production must be ranked as one of its best. Full marks must go to Mimi Hutchinson as Madame Arcati, the medium, who gave an outstanding performance, and Barbara Hughes, as Elvira, the first wife of Charles, and Phyllis Martin as Ruth, his second wife, were both excellent. Antony Hemming as Charles played the part with understanding, and the lesser parts of Edith (Pamela Love), Dr. Bradman (Anthony Moss) and Mrs. Bradman (Vera Thomas) combined to give a well-balanced performance.

The forty-first annual dinner of the **Chief Technical Assistants' Association** was held at Kettners Restaurant, London, on 27th April. Mr. E. R. Wilkinson, C.M.G., M.I.E.E., M.I.Mech.E., proposed the toast of "The Association," to which the chairman, Mr. H. Quinton, B.Sc., M.I.E.E., A.M.I.Mech.E., replied. Mr. Wilkinson speculated that if the nationalised electricity supply organisation were started to-day on the basis of the Herbert Report it might be a better organisation than the present one. But whether it was worth upsetting the organisation at this stage was another matter.

The toast of "The Supply Industry" was proposed by Mr. A. M. F. Palmer, M.P., A.M.I.E.E., and Mr. W. Wilde, B.Sc., A.M.I.E.E., M.I.Mech.E., replied.

The past-chairman, Mr. J. H. R. Hill, D.F.M., M.I.E.E., proposed the toast of "The Guests," to which the doyen of the guests, Mr. L. H. Welch, B.Sc., M.I.E.E., made a felicitous and encouraging response.

At last Tuesday's monthly luncheon of the **Electrical Industries Club** Mr. Leslie Gamage, the president, announced that at the next luncheon (12th June) the principal guest and speaker would be Sir Gilbert Rennie, High Commissioner in London for the Federation of Rhodesia and Nyasaland. On 10th July the Club would hold its first ladies' luncheon.

The annual dinner and reunion of the **Cromptonian Association** will be held at the Café Royal, Regent Street, London, W.1, on Friday, 8th June.

OBITUARY

Mr. H. A. Deacon.—We report with regret the death on Tuesday last of Mr. Horace A. Deacon, managing director of Cryselco, Ltd. Mr. Deacon was born at New Southgate in 1895 and was educated at Bedford School. After serving in the 1914-18 war as a captain in the Bedfordshire Regiment, when he was wounded, he joined Cryselco, Ltd., in 1919. He was successively sales manager (1925), general manager (1944), director (1947) and managing director (1948). During the last war Mr. Deacon was lieut.-colonel commanding the 8th Bedfordshire Battalion of the Home Guard.

Mr. Deacon was a past-president of the Electrical Trades' Commercial Travellers' Association and chairman of the Court of the Electrical Industries Benevolent Association. He had been ill for some time but before that was a popular figure at many electrical gatherings.

Dr. S. Whitehead.—We report with great regret that Mr. Stanley Whitehead, M.A.(Oxon), D.Sc., M.I.E.E., F.Inst.P., director of the British Electrical and Allied Industries Research Association, collapsed and died while walking on Saturday last. Dr. Whitehead was born at Sutton, Surrey, in 1902 and was educated at Sir Walter St. John's School, Jesus College, Oxford, and Queen Mary College, London, of which he was later elected an honorary Fellow. At Oxford he spent a year as a research scholar at the Clarendon Laboratory under Professor Lindemann (now Lord Cherwell) and in 1925 joined the E.R.A. as a technical assistant. He was appointed assistant director in 1939, acting director in 1944 (succeeding Mr. E. B. Wedmore) and director in 1946.

The late Dr. S. Whitehead

Dr. Whitehead was a member of the Royal Institution and had served as visitor and manager. He was chairman of the I.E.E. Measurements Section in 1948-49 and honorary treasurer of the Institute of Physics, of which he was a past vice-president and chairman of the London Branch. He was joint hon. secretary of the Parliamentary and Scientific Committee from 1954 to this year.

Apart from membership of several B.S.I. and I.E.E. committees, Dr. Whitehead was chairman of the I.E.C. Sub-Committee on High-Voltage Measurement. He was the author of works on "The Dielectric Breakdown of Solids" and "Dielectric Phenomena" and he had dealt with these and many other subjects in about thirty papers which he presented before various scientific and technical bodies.

He leaves a widow, a son (17) and a daughter (10) to whom we extend our sympathy.

Mr. T. Hickey.—The death occurred on 27th April of Mr. Tom Hickey, a director of G. Casperson, Ltd., electrical wholesalers, Leeds, with whom he had been associated for fifty years. He took an active part in the development of "Planned Lighting," and was a member of the Illuminating Engineering Society and of the Association of Supervising Electrical Engineers, being a past chairman of the Leeds Branch.

The late Mr. T. Hickey

PARLIAMENTARY REPORT

IN the House of Commons last week Mr. Warbey asked the Lord Privy Seal what assistance would be given by the Atomic Energy Authority to the expanded programme of atomic power now envisaged by the Central Electricity Authority.

Mr. Butler said the C.E.A. had made no announcement of any expansion in the nuclear power programme beyond that envisaged in the Government's White Paper of February, 1955. If such an expansion were decided upon he understood that the Atomic Energy Authority would continue to give as much help and advice as possible.

Mr. Warbey asked whether Mr. Butler was saying that Press reports of a planned expansion to the extent of another £100 million by the C.E.A. on atomic power stations were incorrect, or could he say whether such an expansion was under consideration?

Mr. Butler: "I cannot go farther than the answers I have given up to date; when I have something authentic to say, I shall add it to what I have already said."

Automatic Trunk Telephony

Mr. Alport, Assistant Postmaster-General, informed Mr. Keegan that the first installation to enable subscribers to dial their own trunk calls would be brought into use at Bristol early in 1959, and plans for extension of the service were in hand. These would enable a large number of towns to have this service in the years immediately after 1959. It was bound to be many years, however, before subscribers at all exchanges would be able to dial their own trunk calls.

Coal Consumption

In reply to Mr. Nabarro the Minister of Fuel and Power (Mr. Aubrey Jones) said that for the calendar year 1955 total inland consumption of coal was 215·5 million tons. It was estimated that domestic consumption of electricity and gas amounted to some 13·1 and 9·4 million tons of coal equivalent, respectively.

Scientific Manpower

Mr. Albu asked the Minister of Labour whether the inquiry being carried out by the Social Survey into the numbers and distribution of scientists and engineers included those employed by Government Departments, the Atomic Energy Authority and the Armed Services.

Mr. Iain Macleod said it was confined to the employment of scientists and engineers in private industry, but a similar inquiry covering those employed by Government Departments, the Atomic Energy Authority, the nationalised industries and other main users of scientific manpower was being conducted by his Ministry. Information about the number and types of scientists and engineers called up for National Service was already available.

Unemployment in the Radio Industry

Replying to Mr. Sorensen, the Minister of Labour (Mr. Iain Macleod) said that the registered number of wholly unemployed persons in Great Britain whose last employment was in the manufacture of radio apparatus and valves rose from 1,138 on 14th November, 1955, to 2,573 on 12th March. The number on short time in the week ended 26th November, 1955, was 540 and the estimated total for the week ended 28th April was 4,500.

Trade with Russia

Mr. Page asked the President of the Board of Trade whether he would give an assurance that appropriate steps would be taken to ensure that the proposed increase in exports to Russia would not be allowed to cause a contraction in the development of potential markets for British goods in the Commonwealth and colonies.

Mr. Thorneycroft said he could not give assurances as to how particular firms might conduct their business, but it was certainly the Government's hope that this trade would be additional to our exports elsewhere.

Rural Electrification

During an adjournment debate Mr. Cledwyn Hughes expressed anxiety about the effect of capital expenditure cuts upon rural electrification, especially in Wales. He said that since vesting date spectacular progress had been made, but the Chancellor of the Exchequer's call for overall percentage cuts in the expenditure of the nationalised industries had been implicitly obeyed by the Boards and he found in his area (Anglesey) that there would be a slowing down of at least twelve months in rural electrification schemes. There were areas in England where the proportion of farms and rural premises which had been electrified were as high as 79 per cent. In the country as a whole 59·9 per cent of the farms had been connected. But by March, 1955, the figure for South Wales was 32·2 per cent and for the Merseyside and North Wales area it was 46·1 per cent.

He argued that a larger allocation of the capital available should be given to areas where a comparatively small proportion of farms had been connected to the supply.

Replying, Mr. David Renton, Parliamentary Secretary, Ministry of Fuel and Power, said that by 1st April some 70 per cent of the farms in England had been connected, and 40 per cent of the farms in Wales. The five-year programme for the electrification of 57,000 farms by April, 1958, contained 12,070 farms in Wales. In the first three years 32,369 farms were connected in England and 7,811 in Wales. This showed that more than the annual average needed for the completion of the programme in five years had been achieved. Thus, connections were ahead of schedule when the Government had to make capital cuts. He agreed that there had been a period of understandable uncertainty which led officers of some Area Boards to express fears about particular schemes, but he hoped these would have disappeared since the Government had made clear that the connections for 1956-57 would be not far short of 12,000, which was the annual average necessary to complete the scheme in five years, compared with the 12,500 connections originally planned. The C.E.A., in consultation with the Boards, had agreed that 2,500 farms in Wales would be connected, compared with an original estimate of 2,700. There was no justification for anyone to say that schemes definitely planned by a Board for this year would, on any large scale, have to be postponed for a very long time. He could not see how that could arise on the figures that he had given.

I.E.E. CONVERSAZIONE

The Council of the Institution of Electrical Engineers has decided to revive the Institution Conversazione this year and it will take place on 21st June at the Royal Festival Hall, London. After a reception by the President, Sir George Nelson, Bt., and Lady Nelson, there will be a concert in the auditorium and dancing in the foyer. The artistes engaged for the concert are Adele Leigh (soprano), Beryl Kimber (violin), Owen Brannigan (bass baritone), Richard Farrell (piano) and Arnold Grier (organ). There will be a number of exhibits of electrical engineering interest and buffet refreshments will be available throughout the evening. The price of tickets is 21s each and members can apply for up to three tickets in the first instance; they can also ask for a fourth ticket which will be sent to them if numbers permit, not later than the end of May. Application forms can be obtained from the secretary of the Institution, Savoy Place, London, W.C.2. If successful it is intended that the event shall be repeated at intervals of about three years.

Canadian Electrical Manufacture

The electrical apparatus and supplies industry of Canada showed further expansion in 1954 although at a markedly slower rate than in preceding years. According to returns just issued in Ottawa by the Dominion Bureau of Statistics factory shipments reported by firms in that industry in 1954 were $863,942,000 in value as compared with the 1953 total of $848,190,000, or an increase of about 2 per cent, contrasting with one of 18 per cent in 1952 and 45 per cent between 1951 and 1952. Some additions to the totals should be made in respect of producers who are outside the main group. In these other branches the output of electrical appliances, including electrical accessories for automobiles and household use, amounted in value to $122,849,000. In 1953 the figure was $127,815,000.

Comparative values for the two years of the whole range of products are given in the accompanying table. Progress in the manufacture of television sets accounts for more than the increase in the total value of all the electrical goods made. Wires and cables remain the biggest item, with one-seventh of the grand total. Outstanding among the many decreases (for the most part small) are power plant, radio sets and the majority of household appliances. The reduction in the value of generators made was shared by all types except (a) a.c. 1,000 kVA and under, of 500 r.p.m. and above, and (b) d.c. 1 kW to 1,000 kW; while in motors an outstanding reduction was in single phase induction ½ h.p. and under.

Class of Goods	Selling Value at Works 1953 $ (000)	1954 $ (000)
Generators and parts	20,590	14,366
Motors and parts	46,715	39,860
Transformers	59,143	49,615
Conduit for elec. wiring	6,274	7,142
Switchgear and protective equipment	41,239	41,877
Vacuum cleaners and parts	7,922	7,363
Dry cell batteries	7,770	7,827
Storage batteries	19,897	21,366
Radio receiving sets	28,021	16,509
Television sets	81,305	105,682
Radio and television receiving tubes	8,477	6,608
Flat irons	4,234	4,089
Toasters	2,522	2,757
Incandescent elec. lamp bulbs	16,444	16,674
Fluorescent elec. lamp bulbs	3,599	3,109
Wires and cables	123,441	122,929
Cooking stoves or ranges	27,819	25,341
Rangettes	1,873	1,502
Cooking plates and grills	1,059	976
Elec. welding apparatus and rod	7,567	6,378
Industrial control equipment	12,351	13,488
Domestic water tank heaters—		
Circulating	352	279
Immersion	379	381
Household mechanical refrigerators*	50,943	44,033
Cutouts and fuses	2,945	3,077
Elec. lighting fixtures	23,243	25,577
Wiring devices	14,794	12,241
Convertor equipment	3,315	2,364
Elec. domestic washing machines—		
Automatic	5,149	5,439
Conventional	21,748	18,797
Elec. ironing machines, household	887	530
Heating pads	483	408
Automatic elec. clothes dryers	2,593	3,018
Food mixers	2,244	2,402
Floor polishers	4,277	4,595
Watthour meters	6,936	7,368
Capacitors	†	6,053

* Include all types, elec. not being shown separately.
† Not recorded.

Views on the Herbert Report

The Eastern Electricity Consultative Council has submitted its observations to the Minister of Fuel and Power on the recommendations of the Herbert Committee. It welcomes the idea of a reorganised structure of the electricity supply industry with generation functions separated from the Central Authority and favours particularly the conception of an independent and impartial authority to which it could appeal when in dispute with the Area Board. As at present constituted, the Central Authority is unable to consider representations from Consultative Councils on the bulk supply tariff and the Eastern Council says that as a result it has for several years been frustrated in its attempts to draw attention to the inequities in the coal clause. It is of the opinion that the reconstituted Central Authority should not be required to approve the bulk supply tariff or retail tariffs, which should be fixed by the Generation Authority and the Area Boards respectively. When hearing representations the Central Authority would then not be called upon to exercise judgment on a question to which it had already been committed.

The Council is generally in agreement with the theoretical recommendations on tariffs and attaches particular importance to the statement that there should be further research into the relationship between the cost of supplying different classes of consumers.

It is considered essential that the Council's chairman should remain an ex-officio member of the Area Board and the Council says there are many advantages in sharing office accommodation with the Board. The setting up of Local Councils for each Board District would, it is felt, prove expensive and unworkable at present. The Council agrees that there is a need for consumers to have a right of appeal against its decisions but emphasises that the Consultative Council machinery should be used to the full and should not be circumvented.

New Atomic Site in Dorset

The United Kingdom Atomic Energy Authority announces that a site at Winfrith Heath, Dorset, is being considered for an extension of the type of research activity which is carried on at Harwell.

MECHANICAL HANDLING FILM

A private showing was given in London last week by the Mechanical Handling Engineers' Association of a film, "The Seed is Sown." This is a supplement to the documentary films "Mechanical Handling" and "Conveyors As Your Servants." The earlier films showed mechanical handling methods applied to a variety of industries, but the new film is confined, as its title suggests, to the grain industry.

After early "shots" showing machinery employed in ploughing and preparation of the soil, methods of preparation and processing of the seeds are illustrated. Other processes, such as the production of fertiliser, are then dealt with, and are followed by methods of sowing and harvesting. Mechanical handling of imported grain at the ports is shown and its storage at mills, and after a sequence dealing with the processing of grain, the film concludes with end products, such as biscuits and bread.

Although the film shows little of direct electrical interest it will have a general appeal to institutes, educational authorities and similar bodies. It is well produced in 16 mm colour (running time approximately 26 minutes) and the commentary can be easily followed by non-technical audiences. It is available on loan from the Association, 94-98, Petty France, London, S.W.1.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £189 0s 0d
COPPER, H.C. Electro	ton £338 5s 0d
Fire Refined 99·70%	ton £337 0s 0d
Fire Refined 99·50%	ton £330 0s 0d
COPPER Tubes	lb 3s 3½d
Sheet	ton £412 5s 0d
H.C. wire and strip	ton £381 0s 0d
LEAD, English	ton £110 10s 0d
Foreign	ton £109 0s 0d
MERCURY	flask £85 0s 0d
TIN, block (English)	ton £750 15s 0d
ZINC, G.O.B. Foreign	ton £96 5s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 2s 7⅞d
Sheet	ton £326 15s 0d
Wire	lb 3s 3⅜d
PHOSPHOR BRONZE Wire	lb 4s 10½d
PLATINUM	oz £34 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 25½d—26d

INDUSTRIAL NEWS

Transonic Wind Tunnel

On Friday last the Duke of Edinburgh started up a 20,000 h.p. motor operating the main 22ft diameter fan drive of the new transonic wind tunnel at the Aircraft Research Establishment at Bedford. This English Electric motor is the largest slip-ring induction machine ever built in this country and is comparable with the largest machines of similar design in the United States. Operating in the speed range of Mach 0·6 to 1·3, the tunnel is claimed to be the most up-to-date in the world.

The 9,900 h.p. Brown Boveri compressor is also driven by an English Electric 3-phase 50 c/s 11 kV motor. For starting the 20,000 h.p. main fan drive a 1,200 h.p. 500 V d.c. motor is coupled to the same shaft and this will drive the wind tunnel fan over a speed range of 250 to 485 r.p.m. The main machine, which is equipped with electronic speed control, runs at 500 r.p.m. The English Electric Co., Ltd., also supplied the main h.v. and l.v. switchgear transformers and some 30 auxiliary motors and starters. Also installed in the tunnel as a permanent arrangement is a Pye industrial television camera enabling the operators to observe remotely the characteristics of models undergoing tests.

Iron and Steel Scrap Prices

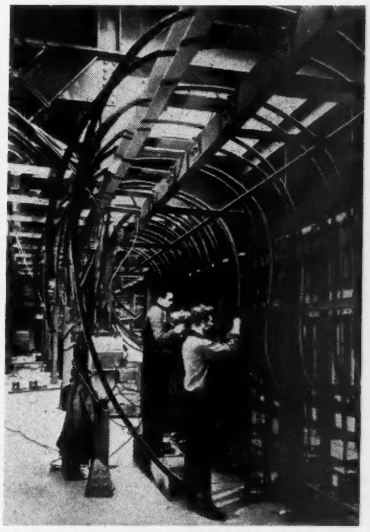
The Board of Trade, after consultation with the Iron and Steel Board, has made the Iron and Steel Scrap Order, 1956 (Statutory Instrument, 1956, No. 631) superseding the Iron and Steel Scrap Orders (Nos. 1-3), 1954-55, which are accordingly revoked. The principal changes are: (1) Maximum prices of all specifications in the schedule are increased by an average of £2 a ton. The increases in railway freight rates which came into force on 23rd April have been taken into account in the revised prices. (2) The definitions of "consumer of iron and steel scrap" and "chemical user of iron and steel scrap" in Article 7 of the current Order have been amended to include holding companies and subsidiaries. The purchase and sale of scrap at prices in excess of the statutory maximum prices will in future be authorised by means of special Orders under Defence Regulation 55 AB. The procedure for buyers and sellers who wish to have authority to pay and charge special prices remains unchanged.

Large Contracts for Henley's

W. T. Henley's Telegraph Works Co., Ltd., has secured a second contract worth $1,000,000 from the Empresa de Telefonos de Bogota for cables.

The first contract secured by Henley's for this company was signed in June, 1954, and after being increased by more than 10 per cent the work was concluded last month. The second contract is in effect a continuation of the work of supplying cables to meet the increased demands by the Bogota Telephone Co. which is extending its operating area to include a number of satellite towns where telephone services on an increased scale have to be provided.

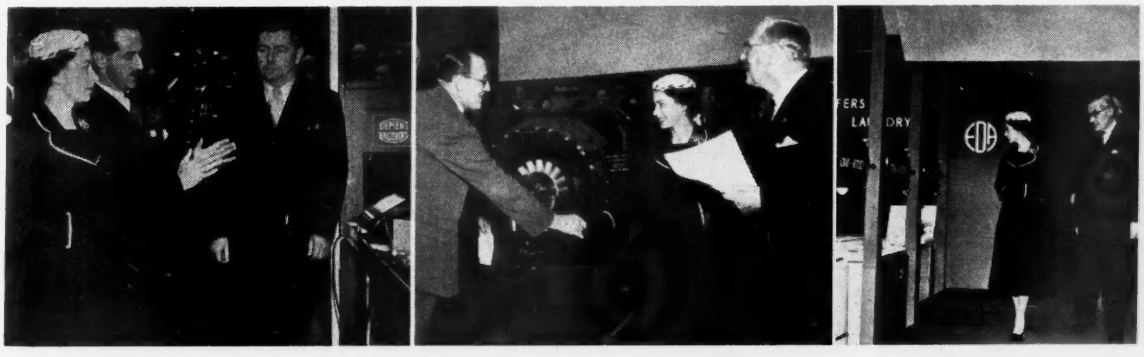
The accompanying picture shows cable racking in progress on stage 1 of the quarter-million pound contract awarded to W. T. Henley's Telegraph Works Co., Ltd., by the Steel Company of Wales. The contract, which is divided into three stages, is for the supply and installation of 11 kV and lower voltage paper, varnished cambric and p.v.c. insulated, lead and aluminium sheathed cables, and also control cables, for the Velindre Works cold reduction plant near Swansea. Messrs. McLellan & Partners are the consultants. Henley's Contract Department already had a depot established in South Wales to deal with the extensive work on their books in this area, but in view of the size of this new contract, which is similar to power station work, a complete organisation including workshops, drawing offices, etc., has been set up on site.



Cable racking in connection with the Henley cable contract for the Steel Company of Wales

Creston Electric

Hartley Baird, Ltd., has recently announced that following the acquisition of H. Fisher (Oldham), Ltd., the name of that company has been changed to Creston Electric, Ltd. The directors remain unchanged as follows:—Mr. R. G. Cooke (chairman), Mr. A. W. M. Hartley (managing director), Mr. R. N. Fitton, and Mr. J. W. McFetridge (financial director and secretary). Mr. A. H. Gambling, who joined the Hartley Baird Group some fifteen months ago



The Queen at the British Industries Fair. Left: Being received by Dr. J. N. Aldington (managing director, Siemens-Ediswan group) (on the right) on the stand of Siemens Brothers & Co., Ltd. Centre: Mr. G. Henderson (sales manager, Bruce Peebles & Co., Ltd.) receives Her Majesty. Right: Mr. D. Bellamy (chairman of E.D.A.) with the Queen at the E.D.A. "Atoms in the Kitchen" exhibit

as personal assistant to the managing director, has been appointed general manager of Creston Electric, Ltd. Mr. Gambling was for many years secretary of the Domestic Electrical Appliances and Electric Cooker Sections of B.E.A.M.A. and associated organisations.

New Black & Decker Branch

Industrial users of portable electric tools manufactured by Black & Decker, Ltd., now have an improved service offered to them in Manchester. On 26th April the new branch office at Knott Mill (telephone: Blackfriars 8865) was officially opened. Representatives of Black & Decker based at this office cover the area of Lancashire, Cheshire and North Wales. This new building houses special facilities for users and prospective users of Black & Decker tools. There is a demonstration theatre which is equipped for practical demonstrations of all types of industrial portable electric tools, for showing films, and for lectures at which up to seventy people can be accommodated. For normal maintenance and repair there is a fully equipped Service Department on the ground floor where users can take their machines for attention.

Part of the Black & Decker demonstration theatre

Electricity Supply Wage Claim

Towards the conclusion of the annual conference of the Amalgamated Engineering Union at Eastbourne last Friday a resolution was passed instructing the executive council to ask the Central Electricity Authority for a substantial increase in the wages of members of the union in its employ, a 40-hour week and three weeks' holiday with pay. These demands are in line with those already decided upon for members employed by engineering concerns.

International Instrument Show

B & K Laboratories, Ltd., of Union Street, London, S.E.1, are holding a second exhibition of specialised electrical and electronic instruments, after the successful show which they held last year. This is at Denison House, Vauxhall Bridge Road, London, and instruments from nine countries are on view from more than forty well-known manufacturers in specialist fields. The exhibition continues until 18th May.

A complete Varian Associates super high resolution n-m-r spectroscopic equipment is one of the highlights, with demonstrations of the advanced techniques of this £10,000 instrument. Based on the fact that the various isotopes of the elements can be separately identified according to their different nuclear gyro-magnetic constants, this penetrating method of spectroscopy now opens up new opportunities for determining molecular structures and identifying and measuring components in a mixture.

Both colour and industrial television are covered by various displays. A closed circuit industrial equipment from Grundig (Germany) is operating throughout the show while phase measuring equipment from Advance Electronics (U.S.A.) and Delay Cable, Hackethal (Germany), both of primary importance in colour television research, are demonstrated.

A new high frequency vibration table (M.B. Mfg. Co., U.S.A.) for testing sub-miniature valves up to 10,000 c/s with automatic frequency cycling can be seen together with automatic spectrum analysis instruments for permanent frequency/amplitude recording.

Sir Albert Braithwaite, M.P., opened the exhibition on Monday of this week and was the guest of honour at a small luncheon afterwards.

Notification of Vacancies Orders

The Minister of Labour and National Service has revoked the Notification of Vacancies Orders, 1952, with effect from 7th May. These Orders, which placed a restriction on the engagement of workers by employers, were devised to provide employment exchanges with a special opportunity of trying to persuade workers to accept jobs of particular national importance.

Visit to Ferranti Computer Centre

A Ministry of Supply Committee recently visited the London computer centre of Ferranti, Ltd. The visitors included Mr. F. J. Erroll (Parliamentary Secretary, Ministry of Supply), Mr. L. G. Gale (Senior Director of Armament Production), Air Commodore Emson, Mr. E. S. Jones (Director of Ammunition Production), Mr. R. Ratcliffe (Director of Instrument Production) and Mr. J. E. Jackson (Director of Ordnance Factories (Filling)).

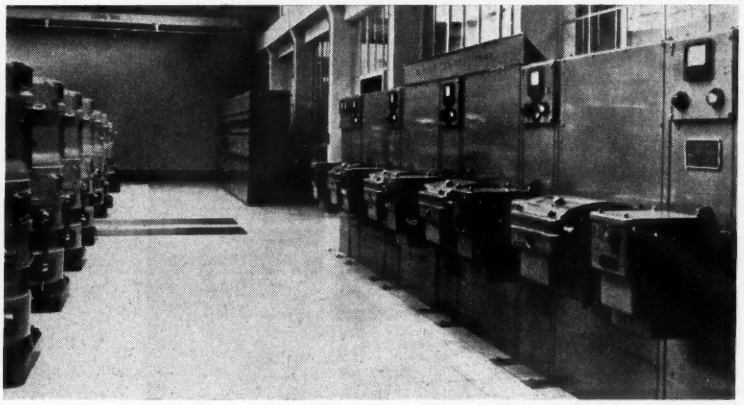
Electrical Commercial Travellers

At a meeting held on 25th April at the Royal Hotel, Cardiff, it was decided to form a South Wales Branch of the Electrical Trades' Commercial Travellers' Association. Among those who attended the meeting were Mr. R. G. Brandon (president), Mr. W. Candelatt (chairman), Mr. F. J. E. Simons (vice-chairman and hon. employment secretary), Mr. L. A. Fickling (hon. subscription secretary) and Mr. J. H. Brown (immediate past-chairman); there were 67 present. Mr. Brandon in his address mentioned that next year's president would be Mr. V. C. H. Creer (A.E.I. Lamp & Lighting Co., Ltd.). It was agreed that Mr. H. Burridge should be the convenor and that the inaugural meeting of the Branch should be held on 16th May.

Pumping Station Control Gear

Four 195 h.p. and one 110 h.p. Barrow service pumps, in the new pumping station at Chew Magna, Bristol, are controlled by a George Ellison switchboard. Each 195 h.p. starter comprises a 400 A hand-operated oil circuit-breaker fitted with overcurrent and under-voltage protection and, in addition, a single-phase preventer and a non-automatic 300 A change-over switch for starting by the Korndorffer method. The auto-transformer is totally enclosed, oil-cooled and provided with tappings of

George Ellison switchboard at Chew Magna pumping station, Bristol



50 per cent, 60 per cent and 75 per cent of the line voltage. An electrical timer is fitted to ensure that the auto-transformer cannot be inadvertently left in circuit. The 110 h.p. pump motor is started direct to line by means of a 200 A oil circuit-breaker. The incoming supply is taken direct to the busbars, and each starter has an A.S.T.A. certified breaking capacity of 25 MVA.

Students Visit B.I.F.

To stimulate their interest in the electrical industry as a possible career, senior boys and girls from county grammar schools in Middlesex were taken on a conducted educational tour of the Electrical Section of the British Industries Fair, Olympia, on 2nd May. The boys and girls, sixth form students, were shown many interesting features of the electrical industry, and experts explained to them how a modern power station operates. They also saw a model of the Calder Hall atomic power station and the film, "The Inquiring Mind," which outlines a young man's future in the electrical industry. The tour was arranged by the British Electrical and Allied Manufacturers' Association. Mr. James Oldroyd, secretary of the B.E.A.M.A., addressed the students on careers in the electrical industry.

Cooking Competition

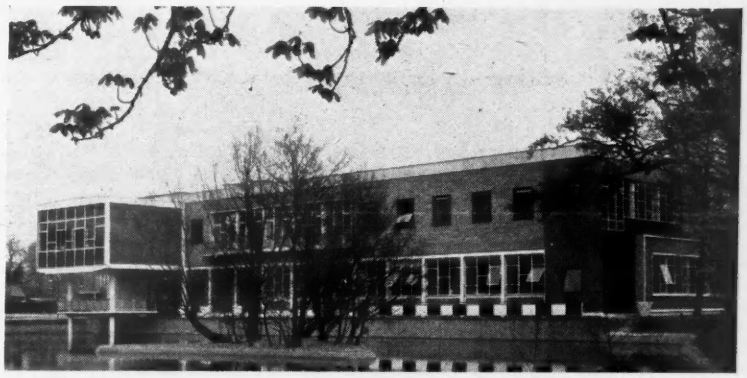
An electric cooking competition, in which housewives will be asked to cook a special "Scottish Week" grill, is being organised by the South of Scotland Electricity Board in connection with Scotland's first Scottish Week, to be held from 16th to 23rd June. The competition will begin this month. Winners in each of the Board's centres will afterwards take part in ten area competitions and subsequently the ten area winners will go forward to a grand final competition in Edinburgh during Scottish Week. The South of Scotland Board will put on in each of its 78 centres a special display of Scottish made electrical appliances during the week.

N.P.L. Open Day

The National Physical Laboratory, Teddington, is holding an "open day" on 25th May. Admission is by ticket only and a limited number of invitations for the afternoon period (1.30 to 5.30 p.m.) are still available on application to the Director.

New Shell Laboratories

Last week the new technical service laboratories of the Shell Chemical Co., Ltd., at Egham, Surrey, were officially opened by Sir Lionel Heald, P.C., Q.C., M.P. These laboratories have been built and equipped at a cost of £300,000. The total floor space is 23,000 sq ft and provision has been made for a total permanent staff of 80 and for additional staff attending courses. Work began on the site in October, 1954, and the laboratories are now fully operational. Their primary purpose is to give technical service to customers in evolving the most effective and satisfactory use of the company's chemicals.



Shell technical service laboratories at Egham

An example of recent work is the reformulation of a customer's solvent blend for "Epikote" resins to give better flow characteristics. Special curing agents have also been developed for a manufacturer of glass laminated materials. One customer "potting" transformers in "Epikote" resins experienced trouble in that cracking occurred due to the metal inserts in the casting when it was cooled to minus 40 deg C. This fault was attributed to the resin system in use, but work at Egham showed that although this particular resin system was not entirely satisfactory at low temperatures, a redesign of the mould used for the "potting" to eliminate heavy metal inserts overcame this trouble.

Lamp Company's Delivery Vehicles

The new A.E.I. Lamp & Lighting Co. delivery vehicles have been painted in the company's colours of dark and light grey with a maroon panel bearing the company's name in yellow. The design has been standardised as far as possible for the whole fleet and a van driver's uniform with an A.E.I. Lamp & Lighting Co. cap badge has been designed in matching colours.

Sodium Lamp Price Reduction

In our last issue we reported that certain lamp manufacturers had reduced the prices of their sodium lamps. The Electric Lamp Manufacturers' Association now informs us that the prices of sodium lamps made by all its members have been reduced.

Trade Announcements

The following appointments within the Southern Region are announced by the lighting division of **Philips Electrical, Ltd.**:—Mr. A. H. Turbin, sales representative for London, W.1, area; Mr. N. E. Beckett, sales representative for London, W.2, W.6, N.W.6 and N.W.10 areas; Mr. W. J. Dyer, special duties in connection with the marketing of special lamps throughout the Southern Region; and Mr. P. D. Chapple, special duties in connection with the marketing of motor car lamps throughout the Southern Region. Mr. J. E. Sketch has been appointed representative for the Cardiff area of Wales for the company's television and radio division.

The A.E.I. Lamp & Lighting Co., Ltd., has recently acquired a large storage depot at Southall, Middlesex. The total storage space is nearly 2½ million cu ft and there is an additional area of over 4 acres for future expansion. Mr. W. R. H. Vickery, who is responsible for distribution planning, including this establishment, has recently returned from a visit to the States where he studied American warehousing practice and their system of packaging and distribution.

The L.P.S. Electrical Co., Ltd., has appointed Leslie Maynard, Ltd., as its representatives covering the area of the Southern Electricity Board. The L.P.S. company states that its new factory at St. Leonards-on-Sea is now in production and the head and sales office at 122, Drury Lane, London, W.C.2, is carrying full stocks of house wiring and radio and electronic industrial type electrical wires and cables.

The programme of extensions to the main works and offices at Watford of **Wild-Barfield Electric Furnaces, Ltd.,** has reached a stage where it is now possible to transfer all the activities of the a.h.f. induction heating division hitherto carried on at Cricklewood to Elecfurn Works, Watford By-Pass, Watford, as from 28th May.

Mr. J. H. Shirley, Saffron House, 23, Charterhouse Street, London, E.C.1, informs us that he is now representing **Marsden & Bateson, Ltd.,** Birmingham, in London and the South Coast.

Change of Address

The Electrical Sign Manufacturers' Association is now at 23, Bedford Row, London, W.C.1 (telephone: Chancery 4847).

DOMESTIC ELECTRICAL EQUIPMENT

Refrigerators

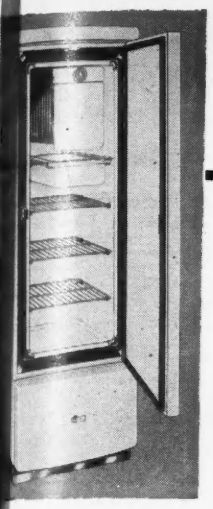
ALTHOUGH it is only a few years since a refrigerator in the home was considered a luxury, sales figures indicate that it is now regarded as an essential item of equipment in the modern kitchen, and with the increasing popularity of frozen foods the number of refrigerators at present in use is greater than ever before. To keep food fresh the temperature must be between 40 and 50 deg F and it is interesting to note that in a normal year in this country there are fewer than thirty days when the weather is cold enough to prevent food from spoiling.

Of the two types of electric refrigerator, compressor and absorption, opinion is divided as to which is the most popular and both continue to have their advocates. While compressor models have the advantage of a greater reserve of refrigeration and lower electricity consumption, the absorption types are favoured by some because, being non-mechanical, they are free from noise and vibration and can be used on either an a.c. or d.c. supply. In view of the restricted space in a large number of kitchens the models most in demand are those with a capacity of up to about 3½ cu ft; fitted with a table top they provide a useful working surface for kitchen needs and their convenient size enables them to be incorporated in kitchen units.

Morphy-Richards have added to their "Astral" range with a 2·3 cu ft console model with interchangeable shelves, door compartments and a frozen food store. Another newcomer to the electric refrigerator market is Main Refrigeration, Ltd., who have recently introduced a 3·2 cu ft absorption model with storage space for about 4 lb of frozen food and 2 lb of ice. One of the most notable innovations since our last refrigerator survey has been the increasing use of colour finishes. Combined with the two basic cabinet finishes of white and cream a choice of forty-eight different colour schemes can be obtained by interchanging the six different coloured tops and four bases of the "Prestcold" D.361, for example.

Prices are slightly higher than at this time last year due to the increased purchase tax which is in the region of £45 to £55 for the smaller models and £100 upwards for the de-luxe types.

Manufacturer	Model	Type	External Dimensions (height, width & depth in inches)	Capacity	Shelf Area	Ice Capacity	Salad Crisper	Frozen Food Chest	Interior Light
ALASKA MANUFACTURING CO., LTD., 73, Clarendon Road, Watford, Herts.	"Alaska" E.70	Absorption	31½×20½×25	2·5 cu ft	5 sq ft	40 cubes	No	No	Yes
C.S.A. INDUSTRIES, LTD., Wharf Street, Warwick.	"English Rose" ER.50	Compressor	36×42×22	4 cu ft	7½ sq ft	1½ lb	No	Yes	No
	"English Rose" ER.92	Compressor	66×21×22	5½ cu ft	10 sq ft	1½ lb	No	Yes	No
	"English Rose" ER.93	Compressor	36×21×22	3 cu ft	6 sq ft	1½ lb	No	Yes	No
COLDRATOR DIVISION OF THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., Peterborough.	AT.18	Absorption	38½×21×21	1·5 cu ft	3 sq ft	18 cubes (1 tray)	No	No	No
	CT.33	Compressor	36⅞×21×21	3·3 cu ft	6·1 sq ft	20 cubes (1 tray)	No	No	No
	CT.45	Compressor	36½×24½×25½	4·5 cu ft	8·3 sq ft	40 cubes (2 trays)	No	Yes	Yes
	CS.71	Compressor	53½×27½×24½	7·1 cu ft	13 sq ft	36 cubes (2 trays)	Yes	Yes	Yes
	CS.81	Compressor	55 11/16×28×25⅞	8·1 cu ft	14·6 sq ft	—	Yes	Yes	Yes
EASICLENE PORCELAIN ENAMEL (1938), LTD., Darlaston, South Staffs.	"Easiclene" Mk. II	Absorption	37⅛×23½×22	2 cu ft	3·4 sq ft	32 cubes (2 trays)	No	Freezer may be used	No
ELECTROLUX, LTD., 153-5, Regent Street, London, W.1.	L.230	Absorption	36¾×21¾×23¾	2¼ cu ft	5 sq ft	14 cubes (1 tray)	No	No	No
	L.500	Absorption	53⅛×26¾×27¼	5 cu ft	9¾ sq ft	64 cubes (4 trays)	Yes	Yes	Yes
	L.730	Absorption	60×30⅛×27⅜	7¼ cu ft	14 sq ft	80 cubes (5 trays)	Yes	Yes	Yes



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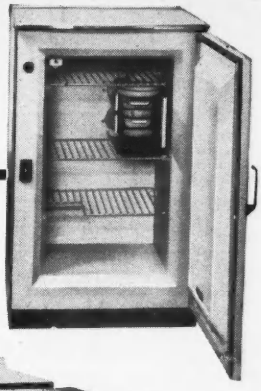

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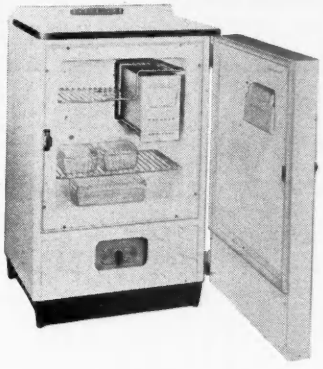

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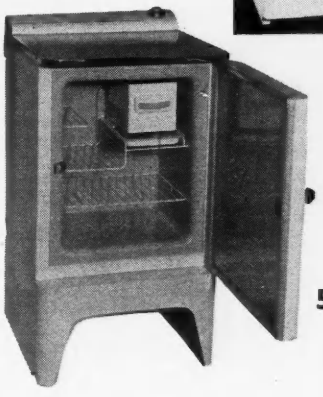

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A. Industries "English
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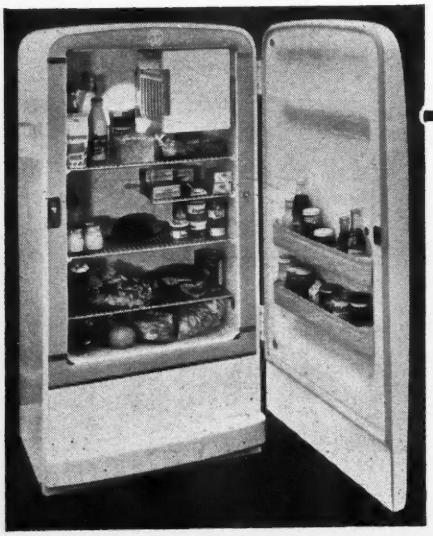
Interior Light	Special Features	Motor	Element Loading	Finish	Price (excl. tax)	Purchase Tax
Yes	Heat resisting plastic table top	—	95 W	White and cream	£34 12 4 plus £2 service charge	£15 14 0
No	Designed and styled to match other " English Rose " kitchen furnishings	⅛ h.p.	—	Cream, sea-green or white cabinet. Stainless steel or " Formica " top	£127 10 0	£59 5 8
No	Designed and styled to match other " English Rose " kitchen furnishings	⅛ h.p.	—	Cream, sea-green or white	£78 0 0	£36 5 5
No	Designed and styled to match other " English Rose " kitchen furnishings	⅛ h.p.	—	Cream, sea-green or white cabinet. Stainless steel or " Formica " top	£53 0 0	£24 12 11
No	Table top, trigger door latch, White enamelled wire shelves	—	150 W	White or cream stoved enamel	£34 6 9	£14 13 3
No	Ice-blue enamelled shelves, freezer and chiller dish, plastic table top	⅓ h.p.	—	White or cream stoved enamel	£44 13 2	£19 6 10
Yes	2 ice-blue enamelled and 1 plate-glass shelves, freezer and " Buttador " compartment	⅓ h.p.	—	White or cream stoved enamel	£52 4 6	£22 15 6
Yes	3 ice-blue enamelled and 1 plate-glass shelves, freezer, chiller, 2 salad drawers and " Buttador " compartment	⅓ h.p.	—	White or cream stoved enamel	£76 15 6	£33 4 6
Yes	3 ice-blue enamelled (with gold trim) and 2 plate-glass shelves, large freezer and " Buttador " compartment	⅓ h.p.	—	White or cream stoved enamel	£100 17 2	£44 2 10
No	Butter conditioner fitted into door	—	180 W	Plastic interior, stoved enamel cabinet, vitreous enamel or plastic top	£38 11 5	£18 10 4
No	2 door shelves, flexible ice-cube releaser, 4 food containers	—	140 W	White or cream	£41 18 0	£19 0 0
Yes	2 door shelves, flexible ice-cube releaser, 4 food containers	—	300 W	White or cream	£77 6 0	£35 1 0
Yes	3 door shelves, flexible ice-cube releaser, 4 food containers	—	350 W	White or cream	£96 1 9	£43 11 3

REFRIGERATORS . . . . . *continued*

Manufacturer	Model	Type	External Dimensions (height, width & depth in inches)	Capacity	Shelf Area	Ice Capacity	Salad Crisper	Frozen Food Chest	Interior Light
ENGLISH ELECTRIC CO., LTD., East Lancashire Road, Liverpool, 10.	EA.34	Compressor	36×22×22	3·4 cu ft	6·4 sq ft	1 lb	No	0·35 cu ft U-evaporator	No
	EA.7501	Compressor	57⅜×28⅜×25⅞	8·3 cu ft	12·2 sq ft	2 lb	Optional extra	0·58 cu ft U-evaporator	Yes
	EA.83	Compressor	57⅜×28⅜×25⅞	8·3 cu ft	14·6 sq ft	2¼ lb	Yes (two)	0·8 cu ft full-width evaporator	Yes
FRIGIDAIRE DIVISION OF GENERAL MOTORS, LTD., Stag Lane, Kingsbury, London, N.W.9.	DT.44T	Compressor	36×24 7/16×24⅜	4·4 cu ft	8·1 sq ft	36 cubelets	Yes	Yes	Yes
	MT.44T	Compressor	36×24 7/16×24⅜	4·4 cu ft	8·5 sq ft	18 cubes	No	Yes	No
	ST.43T	Compressor	36×24 7/16×24⅜	4·3 cu ft	8·2 sq ft	18 cubes	No	Yes	No
	ODT.79	Compressor	54½×27½×26¾	7·9 cu ft	15 sq ft	14 cubes 36 cubelets (2 trays)	Yes	Yes (45 lb)	Yes
	ODT.98	Compressor	57⅜×31×26¾	9·8 cu ft	20 sq ft	14 cubes 36 cubelets (2 trays)	Yes	Yes (51 lb)	Yes
	OMT.81	Compressor	54½×27½×26¾	8·1 cu ft	14·5 sq ft	14 cubes 36 cubelets (2 trays)	Yes	Yes (19½ lb)	Yes
	OMT.100	Compressor	54½×31×26¾	10 cu ft	19·6 sq ft	14 cubes 36 cubelets (2 trays)	Yes	Yes (27½ lb)	Yes
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.	DE.31M	Compressor	36×23×23¾	3·2 cu ft	6·4 sq ft	1·4 lb (1 tray)	No	Yes	No
	DE.41	Compressor	36×23×25⅝	4·2 cu ft	7·7 sq ft	1·4 lb (1 tray)	No	Yes	Yes
	DE.52	Compressor	53 11/16×27½×23 1/16	5·6 cu ft	9·1 sq ft	2·8 lb (2 trays)	Yes	Yes	Yes
	DE.81	Compressor	53 11/16×27 11/16×28 5/16	8·1 cu ft	15·2 sq ft	2·8 lb (2 trays)	Yes (two)	Yes	Yes
LEC REFRIGERATION, LTD., Shripney Works, Bognor Regis	P.42	Compressor	44×23½×23¼	4·2 cu ft	8 sq ft	12 cubes	No	Yes	Yes
	P.62	Compressor	49½×26¼×22¼	6·1 cu ft	—	12 cubes	No	Yes	Yes
	P.6	Compressor	47⅞×26¼×22¼	6·1 cu ft	10·1 sq ft	24 cubes	Yes	Yes	Yes
	P.9	Compressor	60¼×29¾×23	9 cu ft	15·5 sq ft	24 cubes	Yes	Yes	Yes



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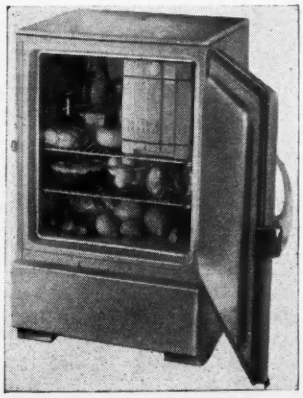

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Frozen Food Chest	Interior Light	Special Features	Motor	Element Loading	Finish	Price (excl. tax)	Purchase Tax
0·35 cu ft d-evaporator	No	Stainless steel evaporator with self-closing door	⅛ h.p.	—	Cream or white	£48 0 0	£21 15 3
0·58 cu ft d-evaporator	Yes	Two door shelves	⅛ h.p.	—	Cream or white	£89 0 0	£40 7 0
0·8 cu ft full-width evaporator	Yes	Full width " Coldrawer," 3 door shelves	⅛ h.p.	—	Cream or white	£100 12 0	£45 12 3
Yes	Yes	Butter compartment, door shelves. Available without table top	⅛ h.p.	—	Vitreous enamelled interior, plastic-based coloured exterior	£57 17 3 (plus £2 service fee)	£26 4 9
Yes	No	Door shelves. Available without table top	⅛ h.p.	—	Snowy white or cotswold cream	£52 16 1 (plus £2 service fee)	£23 18 11
Yes	No	Available without table top	⅛ h.p.	—	Snowy white or cotswold cream	£49 18 4 (plus £2 service fee)	£22 12 8
Yes (45 lb)	Yes	Butter and cheese compartments, door shelves	⅛ h.p.	—	Vitreous enamelled interior, plastic-based coloured exterior	£99 16 8 (plus £4 service fee)	£45 5 4
Yes (51 lb)	Yes	Butter and cheese compartments, door shelves	⅛ h.p.	—	Vitreous enamelled interior, plastic-based coloured exterior	£128 14 8 (plus £4 service fee)	£58 7 4
Yes (19½ lb)	Yes	Butter compartment, door shelves	⅛ h.p.	—	Vitreous enamelled interior, plastic-based coloured exterior	£87 11 1 (plus £4 service fee)	£39 13 11
Yes (27½ lb)	Yes	Butter compartment, door shelves	⅛ h.p.	—	Vitreous enamelled interior, plastic-based coloured exterior	£117 3 6 (plus £4 service fee)	£53 2 6
Yes	No	" Turnaround " top shelf	⅛ h.p.	—	Gleaming white or honeysuckle	£44 2 10 (including service fee)	£19 2 2
Yes	Yes	" Turnaround " top shelf, door racks	⅛ h.p.	—	Gleaming white or honeysuckle	£54 16 2 (including service fee)	£23 18 10
Yes	Yes	Large freezer, door racks	⅛ h.p.	—	Gleaming white or honeysuckle	£75 13 3 (including service fee)	£32 9 9
Yes	Yes	Extra large freezer, door racks	⅛ h.p.	—	Gleaming white or honeysuckle	£101 2 0 (including service fee)	£43 16 0
Yes	Yes	Door shelves, butter compartment	⅛ h.p.	—	White or cream stoved enamel	£72 12 6	£22 13 6
Yes	Yes	Door shelves, butter compartment	⅛ h.p.	—	White or cream stoved enamel	£94 15 0	£29 1 10
Yes	Yes	Door shelves, butter compartment	⅛ h.p.	—	White or cream stoved enamel	£101 2 5	£31 2 5
Yes	Yes	Door shelves, butter compartment	⅛ h.p.	—	White or cream stoved enamel	£121 18 10	£37 8 10

6. *English Electric EA.7501*
7. *English Electric EA.34]*
8. *G.E.C. DE.41*
9. *Frigidaire OMT.100*
10. *Frigidaire DT.44T*
11. *Lec Refrigeration P.9*

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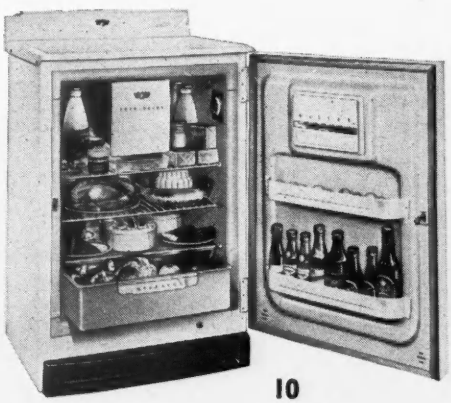

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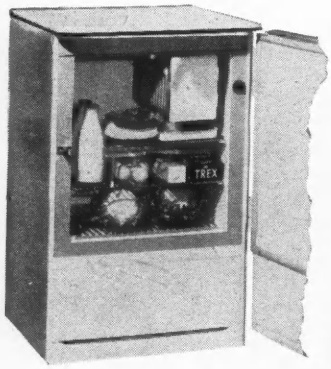
REFRIGERATORS . . . . . *continued*

Manufacturer	Model	Type	External Dimensions (height, width & depth in inches)	Capacity	Shelf Area	Ice Capacity	Salad Crisper	Frozen Food Chest	Interior Light
LIGHTFOOT REFRIGERATION CO., LTD., Abbeydale Road, North Circular Road, Wembley, Middx.	4.LDR	Compressor	40×23×25⅝	4·2 cu ft	7·7 sq ft	1·4 lb	No	Held in freezer	Yes
	5.LDRM	Compressor	53 1/16×27⅛×23 1/16	5·6 cu ft	9·1 sq ft	2·8 lb	Yes	Held in freezer	Yes
	8.LDR	Compressor	55 11/16×27 1/16×28 11/16	8·1 cu ft	15·2 sq ft	2·8 lb	Yes (two)	Yes	Yes
MAIN REFRIGERATION, LTD., 48, Grosvenor Gardens, London, S.W.1.	Main "32"	Absorption	46¼×24½×24¾	3·2 cu ft	6·3 sq ft	2 lb	Yes	Yes (4 lb)	No
MORPHY-RICHARDS, LTD., 6, Conduit Street, London, W.1.	"Astral" B/MA	Absorption	26×20½×21¼	1·5 cu ft	3·1 sq ft	¾ lb	No	No	No
	"Astral" B/LA	Absorption	36×20½×21¼	1·5 cu ft	3·1 sq ft	¾ lb	No	No	No
	"Astral" B/PA	Absorption	36×22×21¼	2·3 cu ft	5 sq ft	1·1 lb	No	No	No
NASH-KELVINATOR, LTD., Hudson Motors Building, Great West Road, London, W.4.	"Kelvinator" C.115K	Compressor	36 1/16×22½×21 13/16	3 cu ft	6 sq ft	16 cubes	No	Yes	No
	"Kelvinator" C.135K or KC	Compressor	38 25/32×27 7/16×23 13/16	4 cu ft	6·7 sq ft	16 cubes	No	Yes	Yes
	"Kelvinator" C.225K or KC	Compressor	53½×24½×27 27/32	7 cu ft	13 sq ft	32 cubes	Yes	Yes	Yes
	"Kelvinator" C.245K or KC, C.265K or KC	Compressor	53½×24½×27 27/32	7 cu ft	13·5 sq ft	46 cubes	Yes	Yes	Yes
PRESTCOLD REFRIGERATION DIVISION, PRESSED STEEL CO., LTD., Cowley, Oxford.	D.361	Compressor	37¾×22½×22	3·6 cu ft	7 sq ft	4½ lb	No	Yes	Yes
	D.601	Compressor	47 13/16×24 13/16×25 5/16	6 cu ft	10 sq ft	24 cubes	Yes	Yes	Yes
	T.801	Compressor	56 5/16×27 11/16×27	8 cu ft	12½ sq ft	36 cubes	Yes	Yes	Yes
	S.313	Compressor	36×21¾×22	3·1 cu ft	6 sq ft	18 cubes	No	Yes	No
WILKINS & MITCHELL, LTD., The Green, Darlaston.	"Servis" MSR.33	Compressor	36×23×21⅜	3·3 cu ft	6 sq ft	1½ lb	No	Yes	No



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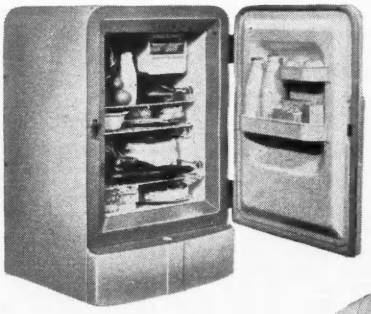

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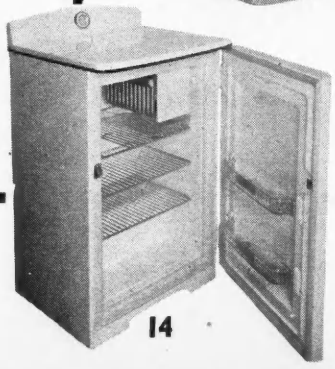

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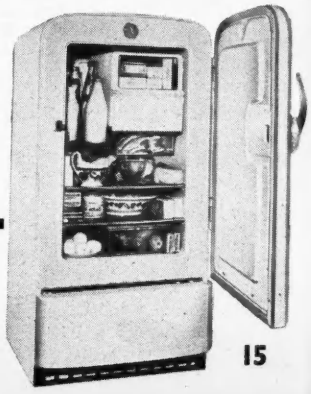

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12. *Wilkins & Mitchell "Servis" MSR.33*
13. *Morphy-Richards "Astral" 2·3 cu ft model*
14. *Lightfoot 4.LDR*
15. *Main "32"*

Interior Light	Special Features	Motor	Element Loading	Finish	Price (excl. tax)	Purchase Tax
Yes	Exterior thermostat control knob, door racks, table top	⅛ h.p.	—	White stoved enamel	£54 16 2 (including service fee)	£23 18 10
Yes	Door racks, Large evaporator and chiller tray	⅛ h.p.	—	White stoved enamel	£75 13 3 (including service fee)	£32 9 9
Yes	Door racks, divided chiller tray	⅛ h.p.	—	White stoved enamel	£101 2 0 (including service fee)	£43 16 0
No	Cooler unit guaranteed for 10 years	—	180 W	Cream or white	£49 17 0	£22 12 0
No	Adjustable shelves	—	95 W	White stoved enamel	£28 19 2	£12 19 3
No	Adjustable shelves	—	95 W	White stoved enamel	£32 11 9	£14 11 9
No	Adjustable shelves	—	95 W	White stoved enamel	£36 19 10	£16 11 2
No	Table top	⅛ h.p.	—	White stoved enamel	£45 10 2	£19 14 7
Yes	—	⅛ h.p.	—	White stoved enamel	£50 4 5	£21 12 8
Yes	—	⅛ h.p.	—	White stoved enamel	£74 5 1	£31 16 11
Yes	Automatic defrost on C.265K or KC	⅛ h.p.	—	White stoved enamel	£90 13 11 (C.245K or KC) £101 0 4 (C.265K or KC)	£39 6 1 (C.245K or KC) £43 19 8 (C.265K or KC)
Yes	48 colour combinations, "Prestalok" door lock, table top	1/10 h.p.	—	Synthetic enamel	£52 0 0	£22 13 5
Yes	Three colours, "Prestalok" door lock	1/10 h.p.	—	Synthetic enamel	£80 10 0	£35 2 9
Yes	Automatic defrosting, "Prestalok" door lock	⅛ h.p.	—	Synthetic enamel	£110 10 0	£48 5 9
No	Six colour tops available, table top	1/10 h.p.	—	Synthetic enamel	£45 0 0	£19 10 0
No	Adjustable thermostat, table top	⅛ h.p.	—	White enamel	£49 0 0	£22 15 8

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16. *"Prestcold" T.801*
17. *"Prestcold" D.361*
18. *Kelvinator C.265K*

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GENERATION AND DEVELOPMENT

Lord Citrine in Moscow

A *Reuter* report from Moscow says that at a Press conference Lord Citrine, who is leading a party of electrical engineers from this country on a visit to Russia, praised the high technical level of Soviet power plants. He thought that there should be more frequent interchange of experience between Russian and British engineers; there might be exchange visits of smaller delegations of experts to deal with particular problems.

Lord Citrine said that Great Britain was specially interested in the Russians' use of peat as fuel and in the prefabrication and erection of power station boilers.

New Type of Reactor

The Washington correspondent of *The Times* reports that a contract has been signed by the United States Atomic Energy Commission for the design and production of an experimental power reactor to use a uranium solution in liquid bismuth as the fuel element. It is believed that this fuel will enable the reactor to operate at high temperatures and low pressures and that it may produce steam under conditions comparable with those in conventional boilers.

Rotherhithe Tunnel Lighting

Last October the London County Council decided to install fluorescent lighting over the footpaths throughout Rotherhithe Tunnel and its approaches, and contracts have now been let with the City Electrical Co., Ltd., the British Thomson-Houston Co., Ltd., and the London Electricity Board to the total value of over £35,000. The present lighting installation, using filament lamps, dates back to the opening of the tunnel in 1908.

The new scheme of lighting, which it is hoped will be completed by October, provides for 600 fittings (300 on each side of the tunnel) each with two 2ft 40 W "new warm white" fluorescent tubes. Although the total load is increased to only 48 kW (from 40·5 kW) the illumination at the road surface will be more than doubled and the amount of light on the tunnel walls, the background against which vehicles are seen, will be trebled. The general level of illumination will be 2·5 ft-candles but a comparatively high level of illumination will be provided at each end of the tunnel.

Fittings made by the B.T.H. Co. are being used throughout. Normally the electricity supply will be from both ends of the tunnel, but special wiring arrangements will make it possible in emergency to feed the whole installation from either end.

Supply to Arranmore

Work has begun on supplying electricity to Arranmore island, about two miles off the coast of Donegal. A canvass conducted by the Irish Electricity Supply Board showed that 245 out of 315 householders want electricity. There are 1,304 people on the island.

The work will take about three months to complete, and 500 poles and 17 miles of lines will be used. Lying between Arranmore and the mainland are three islands, and it is along this route and across four intermediate stretches of water that the line will be taken from Burton port, the nearest source of supply, three miles away. The overhead line will continue to the south-west point of Innishcoe island. From here a conventional three-core cable will carry the supply across the 120 yd wide navigational channel to Rutland island. The line will then continue on poles to the south-west point of Rutland island. The last stretch of water from this point to the south-east tip of Arranmore island, a distance of about a mile, will be covered by a new type of cable. Local fishing boats will be used during the cable laying operations.

Council Proposes to Hire Cookers

As the Electricity and Gas Boards no longer hire cookers to consumers, Derby Corporation Housing Committee proposes to do so itself in the case of Council house tenants and is seeking to borrow £20,000 for the purchase of equipment.

North Wales Water Power

The Central Electricity Authority has informed the Ffestiniog U.D.C. that there is little possibility of restoring the Ffestiniog hydro-electric scheme to the 1956-57 programme unless there is some radical change in the economic situation during the next few months. The Authority, however, has agreed to receive a deputation from the Council to discuss the subject.

Truck Aerial Touches H.V. Line

Following an accident in which the aerial of an Army truck touched a 33 kV overhead line, an officer at the North Midland District T.A. headquarters said that action was being taken to make sure that no similar accident occurred in future. He said that their scientific section had been asked to produce a fuse that would

Left: Some of the party of Central Electricity Authority and Area Board representatives paying a return visit to Russia seen going through the Dneprovsky hydro-electric station at Zaporozne; in the front (second from right) is Mr. J. Eccles, deputy chairman, C.E.A. Right : The party are welcomed in Moscow by Mr. G. Malenkov, who led the recent delegation of Russian electrical engineers to this country ; Lord Citrine is on the left of the speaker

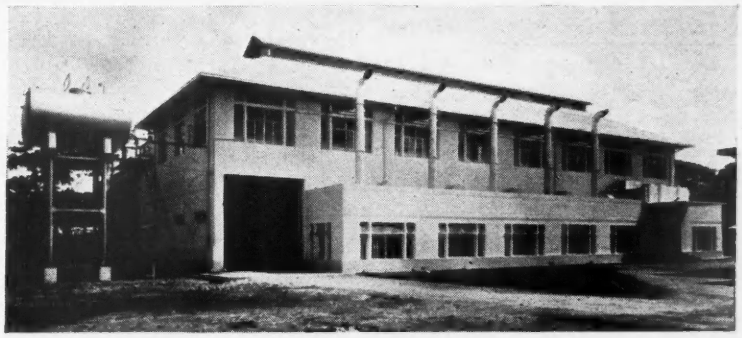
blow if the aerial came in contact with an overhead line. Seven T.A. soldiers and cadets were in the truck at the time of the accident. While trying to lower the tailboard to enable one of the soldiers to escape, Sgt. Ivan Tonge was killed and Major Basil Fenwick was badly burned. Two other soldiers were severely injured.

Start on Borrowdale Scheme

Part of the scheme for supplying electricity to Borrowdale is to be included in this year's programme of the North Western Electricity Board. This was stated by Mr. T. E. Daniel, chairman of the Board, at a recent meeting of the Consultative Council for the Area at Preston. He said that the Board had proposed to spend £8 million on capital schemes but because of the restrictions this amount had been cut by nearly £2 million.

Power Plant for Burma

Rangoon, the capital of Burma, is at present undergoing an intense phase of development, particularly in the field of electricity supply. During the last two years the number of consumers has risen by 13,000 to 43,000, 2,400 new street lights have been installed, and the maximum demand on the steam station has increased by 4,000 kW. The Rangoon Electricity Supply Board placed an order in 1953 with William Jacks & Co., agents for Ruston & Hornsby, Ltd., for five type 8VLBX 1,477 b.h.p. 375 r.p.m. pressure-charged oil engines and five 1,080 kW 6·6 kV G.E.C. alternators. Messrs. Kennedy & Donkin acted as consultants for the power house equipment. Built by Messrs. Clarke & Grieg, the Ahlone station was fully commissioned and running in parallel with the existing 25 MW steam plant in August, 1955.



Ahlone power station, Rangoon, has the largest diesel plant in Burma

An interesting feature in the construction of the power house is the isolation from the rest of the building of the twelve reinforced concrete piles which form the foundations for the engines. Space is available for increasing the capacity of the station to 10 MW and piles have been driven for a sixth set. The engines are set at 16ft centres and all auxiliaries are in an annexe on the front of the building. Reyrolle switchgear and control boards are in separate rooms above the alternators.

Nigerian Supply Extension

It is reported that an agreement has been signed between the Western Regional Government and the Electricity Corporation of Nigeria for a supply of electricity to Ijebu-Ode in Western Nigeria. The Western Region Government is to make a loan of £275,000 to the Corporation for the construction of a transmission line. An immediate start is to be made on the line and it should be completed in two years' time.—*West Africa.*

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 14th May

BELFAST.—Queen's University, 6.15 p.m. Institution of Civil Engineers, Northern Ireland Association. Annual general meeting, followed by "Broadcasting in the Television Age," by R. D'A. Marriot.

IPSWICH.—Electric House, 7.15 p.m. Ipswich & District Electrical Association. Annual general meeting.

LEICESTER.—E.M.E.B. Demonstration Theatre, Charles Street, 6 p.m. I.E.S. Leicester Centre. Annual general meeting.

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "An Elementary Presentation of the Principles of Magnetism and Electromagnetic Induction, with demonstrations," opened by Prof. K. A. Hayes.

St. Ermins Hotel, Caxton Street, S.W.1, 7 p.m. A.S.E.E. Central London Branch. "Water Heating."

Hope House, 45, Great Peter Street, S.W.1, 7 p.m. Women's Engineering Society, London Branch. "Mining Machinery."

WEMBLEY PARK.—Century Hotel, Forty Avenue, 8.15 p.m. A.S.E.E. North-West London Branch. "Atomic Energy in Industry," by A. R. Dixon.

Monday, 14th May, to Friday, 18th May

HASTINGS.—Electrical Trades Union. Annual Policy Conference.

Tuesday, 15th May

BOURNEMOUTH.—Grand Hotel, Firvale Road, 7.15 p.m. A.S.E.E. Bournemouth Branch. Annual general meeting.

CATTERICK.—School of Signals, Catterick Camp, 3.15 p.m. I.E.E. North Midland Centre. Tour of Royal Signals Wing, followed at 6.15 p.m. by redelivery of inaugural address, "A Review of Line and Radio-Relay Communication Systems," by H. Stanesby (chairman of the Radio and Telecommunication Section).

LIVERPOOL.—9, The Temple, Dale Street, 6 p.m. I.E.S. Liverpool Centre. Annual general meeting.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilisation Section. "Mine Locomotives," by T. E. Green.

PORTSMOUTH.—"Air Balloon," 598, Commercial Road, Mile End, 7.30 p.m. A.S.E.E. Portsmouth Branch. "Salesmanship," by R. S. Farr.

Tuesday, 15th May, to Thursday, 17th May

SCARBOROUGH.—Public Transport Association. Annual conference.

Wednesday, 16th May

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "The Sir Adam Beck Generating Station No. 2 at Niagara—A Major Canadian Hydro-Electric Development," by Dr. R. L. Hearn.

John Adam Street, W.C.2, 2.30 p.m. Royal Society of Arts. "Electronic Photography," by Comdr. C. G. Mayer.

Café Royal, Regent Street, 6.15 p.m. Society of Chemical Industry, Chemical Engineering Group. Annual general meeting, followed at 7.30 p.m. by annual dinner.

Wednesday, 16th May, to Friday, 18th May

HARROGATE.—Hotel Majestic. Incorporated Plant Engineers. Annual conference.

Thursday, 17th May

BRISTOL.—Electricity House, 7 p.m. I.E.E. Bristol Graduates' & Students' Section. Annual general meeting, followed by film show.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Annual general meeting, followed at 6.30 p.m. by "Appearance Design," by Sir Gordon Russell.

NOTTINGHAM.—I.E.S. Nottingham Centre. Spring outing.

SOUTHAMPTON.—Polygon Hotel, 7 p.m. A.S.E.E. Southampton Branch. Joint meeting with the Southampton Branch of the Electrical Association for Women.

WATFORD.—Compasses Hotel, High Street, 8.15 p.m. A.S.E.E. Watford Branch. "Electricity in the Oil Industry," by J. Miller.

Friday, 18th May

CREWE.—Royal Hotel, 7.30 p.m. A.S.E.E. Stoke & Crewe Branch. Annual general meeting.

Friday, 18th May, to Monday, 21st May

PITLOCHRY.—Atholl Palace Hotel. I.E.E. Scottish Centre. Spring meeting.

Saturday, 19th May

MAIDSTONE.—Royal Star Hotel, 7.30 p.m. A.S.E.E. Kent Branch. Annual general meeting.

Financial Section

STOCKS and SHARES

MUCH of the activity in the Stock Exchange during the past week has been caused by individual company results and dividend declarations. In the electrical equipment market, the majority of the principal statements are now known, but interesting announcements, such as W. T. Henley's figures, continue to come in at intervals. Otherwise, business in industrials has tended to become humdrum, with a generally firm undertone. In the gilt-edged market, little inspiration was found in the latest return for the gold and dollar reserves, and British Electricity stocks were again virtually unchanged on the week.

Price Changes

A strong revival in Metal Industries ordinary, which rose by 6s 9d to 23s 9d, has been a recent feature among engineering shares. British Aluminium went further ahead to 56s 3d in advance of the " rights " issue of new shares at 40s, dealing in which was expected to start in the latter part of this week. Southern Areas came into prominence before the dividend declaration. Reyrolles were around the best price of the year at 110s, as were C. A. Parsons, after the circulation of the chairman's review with the full accounts. Telephone Rentals reflected the good figures in the preliminary profits statement, and Ward & Goldstone were noticeably strong at 37s 6d. Tube Investments rose half-a-crown on the announcement of a 6¼ per cent interim dividend, which is above the rate indicated at the time of last year's big capital issue.

W. T. Henley's Dividend

Expectations of good results from W. T. Henley's Telegraph Works Co. for 1955 were well satisfied by the 80 per cent improvement now reported in the trading profit at £1·9 million, and by the declaration of a final dividend making a total of 11½ per cent. Last year, shareholders received 10½ per cent in dividend and a special 2 per cent tax-free payment, from capital profits, which is not being repeated. The net profit of £791,000, after taxation of an almost equal amount, is more than half as much again as last year's, and covers nearly two-and-a-half times the amount of the ordinary distribution. With the 10s shares marked up further to 19s 9d, the yield on them became 5·8 per cent.

Cable Results

The Henley announcement practically concludes a very satisfactory set of cable manufacturing companies' results for 1955. Comparisons with 1954 figures are made admittedly with a year in which the fluctuations in copper combined with other factors to produce a generally poor crop. Allowing for this, the improvements in earnings have still been impressive. Group trading profits of B.I.C.C. made good, with plenty to spare, the setback of the previous year, and showed a 60 per cent expansion of net earnings. Those of Telegraph Construction & Mainten-

Price Changes in

Company or Board	Nom. Value	Middle price 7th May	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1956 Highest	1956 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	77½		3	3	3 17 6	80½	75
Brit. Elec. 1974/77	100	76½		3	3	3 18 6	79⅛	73⅜
Brit. Elec. 1976/79	100	81½		3½	3½	4 6 0	84	78⅝
Brit. Elec. 1974/79	100	91½		4¼	4¼	4 13 0	95	88
Overseas Electric Supply								
Calcutta Elec.	£1	19/-	−1/-	6†	6†	6 6 3†	20/9	19/-
East African Power	£1	20/9		7	7	6 15 0	21/3	20/-
Nigerian Elec.	£1	21/-	+3d	10	10	9 10 6	20/9	17/-
Palestine Elec. " A "	£1	21/-		Nil	Nil	Nil	21/-	21/-
Perak Hydro-Elec.	£1	16/-		10	10	—	17/6	14/9
Equipment and Manufacturing								
Aberdare Cables	5/-	13/-x.d.		17½	17½	6 14 6	13/6	10/6
Aerialite	1/-	5/6		88⅛	45*	8 3 6	6/9	5/-
Allen, W. H.	£1	75/-	+1/3	20	20	5 6 8	78/-	67/-
Aron Elec. Ord.	£1	55/9		15	15	5 7 6	56/-	53/6
Assd. Automation	10/-	27/-		10	10	3 14 0	34/9	24/6
Assoc. Elec. Ord.	£1	71/3	+1/3	14	15	4 4 3	85/6	57/9
Automatic Tel. & El.	£1	62/6x.d.		15	15	4 16 0	72/6	59/6
Babcock & Wilcox	£1	80/-x.d.	+2/9	15	15	3 15 0	85/6	64/-
Baldwin, H.	2/-	4/9		20	20	8 8 6	5/-	3/9
Bakelite	10/-	29/6		16	16	5 8 6	34/-	26/9
Berry's Electric	5/-	6/3	+3d	—	10‡	8 0 0	6/3	5/9
British Aluminium	£1	56/3	+3/9	12	12	4 5 3	57/-	40/6
B.I. Callender's	£1	51/9	−1/6	10	12½	4 16 6	54/3	45/-
B.I. Callender's 6% Pref.	£1	22/-		6	6	5 9 0	22/6	20/3
British Thermostat	5/-	28/9		27½	27½	4 15 0	31/9	24/6
British Vac. Cleaner	5/-	6/9x.d.		30	15*	11 2 3	8/9	6/9
Brook Motors	10/-	40/-		20	25	6 5 0	44/-	40/-
Brush Ord.	5/-	7/-		10	10	7 2 9	7/9	6/3
Bulgin, A. F.	1/-	7/6	+3d	45	50	6 13 3	7/3	6/6
Burco Dean	5/-	9/-	−6d	—	22½	12 10 0	13/3	8/6
Chloride El. Storage " A "	£1	63/9x.d.		17½	17½	5 9 9	73/6	60/9
Clarke Chapman	£1	112/6		20	22½	4 0 0	112/6	89/6
Cole, E. K.	5/-	17/6		27½	17½*	5 0 0	22/3	16/-
Cossor, A. C.	5/-	7/9	−6d	10	15	9 13 6	10/3	6/9
Crabtree	10/-	28/6		20	20	7 0 3	29/3	27/-
Crompton Parkinson Ord.	5/-	14/6	−3d	20	16*	5 10 3	15/-	12/3
De La Rue	5/-	19/-	−6d	20	30	7 18 0	20/3	15/-
Decca	4/-	30/-		56¼	43¾*	5 16 9	44/9	24/9
Desoutter	5/-	27/3		25	30	5 10 0	32/9	25/9
Dewhurst	2/-	7/-	+6d	24	30	—	6/6	5/3
Dictograph Tel.	2/-	6/3		20	20	6 8 0	6/9	6/-
Dubilier Condenser	1/-	4/-	−3d	25	25*	6 5 0	4/6	4/-
E.M.I.	10/-	29/6		10	15	5 4 3	37/-	27/-
Electrical Components	5/-	13/9		20	25	9 1 9	16/-	13/9
Elec. Construction	£1	28/9		15	8½	5 18 3	29/9	25/-
Enfield Cable Ord.	£1	17/3	−1/-	Nil	Nil	Nil	19/3	14/9
English Electric	£1	55/-		12½	12½	4 11 0	66/3	47/3
English Electric 3¾% Pref.	£1	13/6		3¾	3¾	5 11 0	14/6	12/6
Ericsson Tel.	5/-	39/-	−6d	25†	25*†	3 4 0†	42/9	33/6
Ever Ready	5/-	29/3x.d.	−1/-	35	35	5 19 9	32/9	24/-
Falk Stadelmann	£1	38/9		15	17½	9 0 9	45/9	37/6
G.E.C. Ord.	£1	57/6		12½	14	4 17 3	65/6	50/-
G.E.C. 6½% Pref.	£1	23/9		6½	6½	5 9 6	23/9	21/3
General Cables	5/-	12/9		30	30	11 15 3	13/9	12/9
Greenwood & Batley	£1	46/3		17½	17½	7 11 3	47/6	45/-
Hackbridge Cable	5/-	23/9		20	25	5 5 3	24/6	18/9
Hackbridge & Hewittic	5/-	18/9		25	30	—	22/-	17/3
Heatrae	2/-	4/9		12½	15	6 6 3	5/1	5/-
Henley's	10/-	19/9	+2/-	10½	11½	5 16 6	19/9	14/-
Holophane	5/-	18/9	+1/3	25	30	8 0 0	19/-	17/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

* After scrip issue. † Free of income tax. ‡ Dividend forecast.

ance also improved by more than a half. Enfield Cables turned a deficit into a net profit of nearly £150,000, while in the case of Aberdare Cables (Holding), although the two figures are not this time strictly comparable, there was also a large gain. Net surpluses of Johnson & Phillips and London Electric Wire were up by about 27 and 20 per cent respectively. The Scottish Cables and Hackbridge Cable companies ended their financial years in March, and the results are not due to be announced for a month or two.

Electrical Investments

Company or Board	Nom. Value	Middle price 7th May	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1956 Highest	1956 Lowest
Equipment and Manufacturing—continued						£ s d		
Hoover	5/-	27/6	+6d	70	50	9 1 9	39/3	23/-
I.C.I.	£1	48/6x.d.	+1/-	10	10	4 2 6	49/9	41/3
Intl. Combustion	5/-	20/6		25	20*	4 17 6	25/-	15/3
Johnson & Phillips	£1	41/3x.d.	+6d	15	15	7 5 6	46/6	37/6
Lancashire Dynamo	£1	45/-		15	11*	4 17 9	49/9	40/9
Laurence, Scott	5/-	16/3x.d.	+6d	12½	15	4 12 3	16/9	13/3
Lister, R. A.	£1	33/9	+1/3	9·3	10	5 18 6	35/3	27/6
London Elec. Wire	£1	51/3x.d.		12½	12½	4 17 6	52/9	46/6
Lucas, J.	£1	35/-		7½	7½	4 5 9	40/3	31/3
Marryat & Scott	2/-	10/3		25	30	5 17 0	11/-	9/6
Mather & Platt	£1	58/6	+1/6	13·4*	15	5 2 6	65/3	51/6
Metal Industries	£1	23/9	+6/9	9	9	—	27/-	16/3
Midland Elec. Mfg.	£1	47/6		10	12½	5 5 3	48/6	43/6
Morphy-Richards	4/-	23/9	+6d	35	50	8 8 6	27/3	21/9
Murex	£1	67/6	+1/3	15	20	5 18 6	70/3	60/-
Newman Ind.	2/-	2/6		10	10	8 0 0	2/9	2/1
Oldham & Son	1/-	2/6		17½	20	—	3/-	2/4
Parnall (Yate)	5/-	6/6	−1/6	14	12	9 4 6	9/6	5/6
Parsons, C. A.	£1	85/-x.d.	+3/3	10	10	2 7 0	85/-	61/6
Plessey	10/-	71/3	+1/3	27½	30†	4 4 3	87/6	56/-
Pye "A" Deferred	5/-	18/-	+6d	20	12½*	3 9 6	21/3	14/-
Revo	10/-	11/-		9	9	8 3 6	11/9	8/3
Reyrolle	£1	110/-	+5/-	15	16½	2 19 0	110/-	81/-
Rheostatic	4/-	8/3x.r.		22½	18½*	—	13/3	12/-
Richardsons Westgarth	5/-	17/-		15	16⅔	4 18 0	17/-	13/9
Scottish Cables	4/-	17/9	+1/-	27½	27½	6 4 0	17/6	15/9
Smith (England), S.	4/-	13/6	−6d	17½	17½	5 3 9	14/3	11/-
Southern Areas	£1	27/6	+3/9	7½	10	7 5 6	28/9	21/-
Strand Elec.	5/-	7/9		17½	15*	9 13 6	8/6	7/3
Sturtevant	5/-	25/3x.d.		14·4†	15†	2 19 6†	31/3	25/3
Sun Elec.	£1	36/-		15	20	11 2 3	37/6	36/-
Switchgear & Cowans	5/-	14/9		20	25	8 9 5	17/-	14/6
Taylor Tunnicliff	5/-	12/3		15	15	6 2 6	14/-	11/3
T.C.C.	10/-	42/6	+6d	25	25	5 17 9	43/-	40/6
T.C. & M.	£1	30/6		8½	8½	5 11 6	34/-	26/-
Telephone Mfg.	5/-	7/6	+6d	10	10	6 13 3	8/6	6/3
Thorn Elec.	5/-	18/9	−6d	20	15*	4 0 0	22/6	16/-
Thornycroft	£1	46/3	+1/3	15	15*	6 9 9	49/9	41/3
Tube Investments	£1	67/6	+2/6	22½	14*†	4 2 9	70/6	54/9
Vactric	5/-	15/-	+9d	10	15*	—	15/-	11/6
Veritys	5/-	8/9		12½	12½	7 2 9	10/-	6/9
Walsall Conduits	4/-	12/-		70	70	—	13/6	10/9
Ward & Goldstone	5/-	37/6	+3/-	50	30*	4 0 0	38/3	29/-
Watford	2/-	6/9x.d.		25	25	—	7/6	6/6
Westinghouse Brake	£1	81/3		18	18	4 8 6	100/-	71/6
West, Allen	5/-	14/6	+3d	15	15	5 3 6	14/6	11/6
Wolf Electric	5/-	19/-		20	20	5 5 3	26/3	19/-
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
A. Ord.	100	80x.d.		6	6	7 10 0	80	66
Ord.	100	50x.d.		3¾	3¾	7 10 0	54	45
Anglo-Portuguese	£1	23/-x.d.		8	8	6 19 3	23/6	20/3
Brit. Elec. Traction:								
Def. Ord. "A"	5/-	19/-		50	22½*	5 18 6	20/-	15/6
Cable & Wireless:								
Ord.	5/-	11/6x.d.	+3d	10	10	4 7 0	11/3	9/6
4% Loan	100	92		4	4	4 7 0	92½	88
Calcutta Trams	£1	23/-	−6d	6†	7½†	6 10 6†	26/3	23/-
Cape Elec. Trams	£1	17/6		5½	7½	8 11 6	20/3	18/-
Marconi Marine	£1	31/6		10	10	6 7 0	34/-	31/-
Oriental Tel. Ord.	1/-	75/9x.d.		16	—	—	90/-	78/-
Telephone Rentals	5/-	11/9	+6d	12½	12½	5 6 6	11/9	9/9

Dividends and Yields

The cable manufacturing companies mentioned above are dealing conservatively with the increases in profits during 1955. Dividends are being maintained at the same rates as before, except in the case of B.I.C.C., who are raising the dividend from 10 to 12½ per cent but, like Henley's, are omitting the supplementary tax-free distribution of the year before. Profits provide fourfold cover for the dividend, on the basis of which the yield on the £1 shares is a little over 4¾ per cent. On the London Electric Wire dividend of 12 per cent the yield is also below 5 per cent. Telegraph Constructions at 30s 6d give 5½ per cent on the money, while on Aberdare and Johnson & Phillips the returns are respectively 6¾ and 7¼ per cent. In the case of the last-named company, information about a capital issue is expected to be given at the annual meeting next Thursday, 17th May.

English Electric

The £1 shares of the English Electric Co. have been through some sharp fluctuations, apparently on talk about the possibility of a new capital issue. This put the price down to under 55s at one time, but there was an immediate rebound to 57s 6d (the official quotation stayed at 55s) on the report of a statement to the effect that no issue is at present intended. The company was last in the market for new funds in October, when some £11 million was raised by a rights issue of new ordinary shares. The final dividend for 1955 was paid on capital so increased to £15·2 million. It made a total of 12½ per cent, which was covered three times over by the profits of the year. The yield on the shares is a fraction over 4¼ per cent which, incidentally, is just about in line with that from A.E.I. ordinary at 71s 3d.

Atlas Electric

A rise of 4s 9d to 35s 6d in Atlas Electric & General Trust £1 shares was induced by the preliminary annual results, which disclose another large step forward in the strikingly successful growth of the company's earnings. With an improvement, this time, of more than a quarter in net income (after a larger tax charge), the company is raising the dividend for the year from 6½ to 9 per cent, and so retains unbroken the record of an increase in the distribution for every year since dividends were resumed in 1948. In advance of the full report, it was assumed that part of the latest expansion reflected the full employment of an earlier issue of debenture stock. This is now among the largest of the investment lists, holding a year ago quoted securities valued then at over £15½ million. The yield on the shares goes up now to over 5 per cent.

REPORTS and DIVIDENDS

Enfield Cables, Ltd.—The annual meeting will be held on 30th May. In his circulated statement Sir Philip Warter (chairman) says that they are beginning to reap the benefits of the reorganisation of the business and this is reflected in the group profit before taxation in 1955 of £148,260, against a loss in 1954 of £114,875. After provision for taxation and preference dividends, however, the group profits are not large enough to justify the payment of an ordinary dividend. As compared with 1954, the sales in 1955 were 48 per cent greater and export sales 52 per cent greater. The South of Scotland Electricity Board ordered approximately four miles of 132 kV cable. Overseas a submarine cable installation between Newfoundland and Bell Island was successfully commissioned as was a 150 kV cable in Holland. At present being installed is a double-circuit 115 kV installation in the city of Ottawa. Construction of the new technical laboratory and the extension of the paper cable factory will start in August or September, and plans for extension and re-layout of the rubber and plastic cables factory will be finished by August. New developments include cables for use at very low temperatures, new types of ship-wiring cables, railway cables and improvements in super-voltage cables. The relative prices of copper and aluminium have resulted in the increased use of aluminium as a conductor. They can supply either copper or aluminium as required. Regarding the current year there has been a disappointing reduction in orders received during the first quarter as compared with the level of the second half of 1955, but up to date the orders received, sales invoiced, production and profit have all been about the level of the corresponding period of last year.

W. T. Henley's Telegraph Works Co., Ltd.—The preliminary statement for 1955 shows a group trading profit of £1,897,656, as compared with £1,046,971 for the preceding year, to which is added other income of £168,842. After meeting all charges, including £782,082 for taxation, the net profit is £791,172 (against £499,074). General reserve and other provisions receive £465,102 and it is proposed to pay a final ordinary dividend of 9 per cent, making 11½ per cent for the year. For the previous year the dividend was 10½ per cent, in addition to which a special capital profits distribution of 2 per cent was made. The balance carried forward is £849,945 (against £851,409 brought in).

Senior Economisers, Ltd.—The report and accounts for 1955 show a profit on trading of £223,136, as compared with £190,190 for the previous year, which with other income makes £233,937. After meeting all charges, including £95,505 for taxation, the net balance is £102,720 (against £89,449). It is proposed to place £50,000 to general reserve and to pay a final dividend of 25 per cent (against 22½ per cent), making 45 per cent for the year (40 per cent). The balance carried forward is £49,992 (against £44,574 brought in). Mr. D. C. Lycett Green (chairman) says that the value of orders on hand at the close of the year was again satisfactory and unless trading conditions deteriorate the company expects another successful year.

The Rheostatic Co., Ltd.—In his circulated statement covering 1955, presented at the annual meeting held on 4th May, Mr. M. J. Gartside (chairman and managing director) said that both turnover and profit attained new high levels, and exports accounted for a higher percentage of the total than in previous years. The increase of turnover had been spread over the whole range of their products. The productive capacity would be further added to in the immediate future by the completion of the extensions to the premises at Frimley, Surrey.

Mr. Gartside referred to the proposal to increase the capital of the company from £650,000 to £900,000 and to offer further shares at par to the ordinary stockholders on the basis of one new share for every share held, and at the subsequent extraordinary meeting the increase in capital was approved.

T. Clarke & Co., Ltd., report a profit for 1955 of £34,005, as compared with £20,492 for the preceding year, after meeting all charges, including £35,537 for taxation. It is proposed to pay a final dividend of 8 per cent on capital increased by a 50 per cent scrip issue. An interim dividend of 10 per cent was paid on the smaller capital. For 1954 the total distribution on the old capital was 20 per cent.

Tube Investments, Ltd., has announced an interim ordinary dividend of 6¼ per cent on capital of £14,494,862 as increased by a one-for-one rights issue. This compares with the directors' forecast of 5¾ per cent at the time of the issue.

Telephone Rentals, Ltd., reports that after providing £341,179 for taxation, the group profit for 1955 is £429,313, as compared with £349,290 for 1954. It is proposed to pay a final ordinary dividend of 7½ per cent, maintaining the distribution for the year at 12½ per cent.

The Atlas Electric & General Trust, Ltd., in a preliminary statement, reports a total income for the year ended 31st March last of £1,064,477, as compared with £860,486 for the previous year, and after meeting all charges, including £430,630 for taxation, the net revenue is £504,553 (against £395,936). Reserves receive £165,000 and it is proposed to pay a final dividend of 6 per cent, making 9 per cent for the year (against 6½ per cent). The balance carried forward is £234,039 (against £202,567 brought in).

G. N. Haden & Sons, Ltd.—The group trading profits for 1955 are £251,205, as compared with £231,492 for the preceding year. Of this taxation absorbs £126,542. It is proposed to maintain the ordinary dividend for the year at 20 per cent and to make a two-for-three scrip issue, for which Treasury consent has been obtained.

Eveready South Africa, Ltd., is paying an unchanged interim dividend of 10 per cent.

New Companies

F. A. Page, Ltd.—Registered 20th March. Capital £5,000. Electrical, radio, sound, television, lighting, electronic, heating, telephone, mechanical and general engineers, etc. Directors: F. A. Page and H. W. Page. Regd. office: 16, Saint Margaret's Green, Ipswich.

Ward & Armitstead, Ltd.—Registered 21st March. Capital £1,500. Manufacturers of and dealers in electrical goods of all kinds, radio and television sets, etc. Directors: F. J. Ward, Lilian P. Ward, D. W. Armitstead and Mrs. Betty F. Armitstead. Regd. office: 103, Felpham Way, Bognor Regis, Sussex.

R. G. Hutchinson, Ltd.—Registered 22nd March. Capital £2,000. Electrical engineers, etc. Directors: R. G. Hutchinson (permanent) and Miss Margaret Fox. Regd. office: Victoria Works, Swinnow Road, Lowtown, Pudsey, Leeds.

Hampson & Barratt, Ltd.—Registered 17th March. Capital £1,000. Electricians, etc. Directors: H. Hampson and C. M. Barratt. Regd. office: 52, Stamford Square, Ashton-under-Lyne, Lancs.

Cathodic & Electrolytic Processes Co., Ltd.—Registered 15th March. Capital £100. Manufacturers and marketers of all types of cathodic and electrolytic processes, instruments and apparatus for the prevention of corrosion, etc. Regd. office: Arundel House, Arundel Street, Strand, W.C.2.

S. R. West (Electrical & Refrigeration), Ltd.—Registered 13th March. Capital £4,000. Electrical engineers and general electrical installation contractors, radio, heating, ventilating, refrigerating and cold storage engineers, etc. Directors: S. R. West and Daisy West. Regd. office: 92, Shirley Road, Southampton.

T. Frame & Son, Ltd.—Registered 14th March. Capital £2,500. Electrical engineers and general electrical installation contractors, etc. Directors: T. G. Frame, Jane Frame, W. L. Jones and I. E. Jones. Regd. office: 65a, Mill Street, Trecynon, Aberdare, Glam.

Staar Electronics, Ltd.—Registered 3rd February. Capital £100. Solicitors: Theodore Goddard & Co., 5, New Court, W.C.2.

Liquidations

Midland Wireless and Electrical Appliance Co., Ltd.—Meetings of members and creditors on 5th June at the offices of Leeds Barlow & Co., 66, Alma Street, Luton, to receive an account of the winding-up by the liquidator, Mr. H. L. Barlow.

Electrical & General Sundries, Ltd.—Particulars of claims by 25th May to the liquidator, Mr. H. E. Brown, 36, Dover Street, Piccadilly, London, W.1.

Bankruptcy

J. G. Barrett, carrying on business at 34, Broad Street, Pendleton, Salford, Lancs, under the style of Barrett's Electrical Installations, coach driver and electrical engineer.—Trustee, Mr. F. C. Ormrod, 20, Byrom Street, Manchester, 3, Official Receiver, released 20th April.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 0d each including postage) will be obtainable after 16th May from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1951

21195. Marconi's Wireless Telegraph Co., Ltd.—Radio and similar transmitting installations. 11th March, 1952. (748862.)

28388. Taylor, H. C.—Television. 4th April, 1955. (748993.)

1952

12432. Standard Telephones & Cables, Ltd.—Railway traffic control apparatus. 16th May, 1952. (748866.)

19913. Kelvin & Hughes, Ltd.—Electromechanical oscillator device. 4th August, 1953. (748869.)

23349. Junghans, H.—Telephone handsets. 17th September, 1952. (749111.)

27640. General Electric Co., Ltd., and Morris, C. H.—Vapour electric arc convertors. 3rd November, 1953. (748916.)

27690. Electric & Musical Industries, Ltd.—Generation of modulated carrier wave energy. 2nd November, 1953. (748935.)

27940. Hinksman, E. A.—Variable reactance reactors. 8th February, 1954. (749000.)

30548 General Electric Co., Ltd., McKeag, A. H., Nixon, R. D., and Welch, E. E.—Cathode-ray tubes. 1st December, 1953. (748875.)

31213. General Electric Co., Ltd., and Cates, J.—Electric circuit arrangements for starting and operating from an a.c. supply two low pressure electric-discharge lamps each having two heatable cathodes. 9th December, 1953. (748876.)

32749. Cathodeon, Ltd.—Television pick-up tubes. 22nd December, 1953. (749058.)

1953

716. English Electric Co., Ltd.—Grid controlled rectifier installations. 11th January, 1954. (749059.)

790. General Electric Co., Ltd., Riddiford, R. L., Simpson, A. I. F., and Salisbury, F.—Devices for making electrical connections with contacts projecting from electric valves. 11th January, 1954. (748882.)

866. British Thomson-Houston Co., Ltd.—Electric transformers. 1st January, 1954. (748883.)

2101. Electric & Musical Industries, Ltd.—Optical projection apparatus. 25th January, 1954. (748937.)

2677. Ferranti, Ltd.—TR cells. 29th April, 1954. (748885.)

3177. Radio Corporation of America.—Colour television control network for background level control. 4th February, 1953. (748938.)

4685. Cinema-Television, Ltd.—Apparatus for electrical frequency measurement. 9th February, 1954. (749060.)

4847. Siemens & Halske Akt.-Ges.—Electrical order telegraph installations. 20th February, 1953. (749061.)

5127. Simmonds & Stokes (Niphan), Ltd.—Electrical sockets and plugs. 10th February, 1954. (749062.)

6483. Metropolitan-Vickers Electrical Co., Ltd.—Multi-break air- or gas-blast electric circuit-breakers. 17th February, 1954. (749004.)

7028. Telefonaktiebolaget L. M. Ericsson.—Electric stabiliser circuits. 13th March, 1953. (748890.)

7846. Electric & Musical Industries, Ltd.—Cathode structures for electron discharge devices. 18th March, 1954. (749115.)

8392. Standard Telephones & Cables, Ltd.—Electron discharge tubes. 26th March, 1953. (748945.)

8393. Standard Telephones & Cables, Ltd.—Travelling wave apparatus. 26th March, 1953. (748946.)

9521. Texaco Development Corporation.—Generation of nuclear power. 8th April, 1953. (749064.)

9595. National Research Development Corporation.—Circuits using cold cathode scaling tubes. 7th April, 1953. (748950.)

10210. Hoover, Ltd.—Commutators for dynamo-electric machines. 9th April, 1954. (748893.)

12407. Ely, R. E. V.—X-ray tube. 1st July, 1954. (749071.)

13769. Electric & Musical Industries, Ltd.—Wired signal relaying systems. 6th May, 1954. (748952.)

14196/7. General Electric Co., Ltd., and Farnsworth, J.—Electric capacitors. 20th May, 1954. (748899 and 748900.)

14871. Philco Corporation.—Electrical system. 28th May, 1953. (749118.)

15214. Quasi-Arc, Ltd.—Electrodes for arc welding. 20th May, 1954. (748902.)

16221. Licentia Patent-Verwaltungs Ges.—Telephone system with two-party connections. 12th June, 1953. (749120.)

17573. General Electric Co., Ltd., and Morrow, A. B.—Voltage stabilising apparatus. 24th September, 1954. (749077.)

18489. United Kingdom Atomic Energy Authority.—Gas-discharge devices such as cold cathode tubes. 2nd July, 1954. (748906.)

18965. General Electric Co., Ltd., Antrich, D., and Gardiner, H. W. B.—Electrically operated governor arrangements. 28th June, 1954. (749081.)

19177. Hoover, Ltd.—Washing machines incorporating squeeze driers. 29th June, 1954. (748907.)

19369. General Electric Co., Ltd., and Bryer, R. F.—Multi-position electric switches. 17th June, 1954. (749083.)

19680. Hivac, Ltd.—Lightning arrestor devices. 24th June, 1954. (748908.)

21028. Licentia Patent-Verwaltungs Ges.—Dry-plate rectifier cell. 29th July, 1953. (748963.)

21357. General Electric Co., Ltd., and Simpson, A. I. F.—Electric circuit arrangements including band-pass filters. 3rd August, 1954. (749016.)

23295. British Thomson-Houston Co., Ltd.—Cooling of electric motors, in particular for small domestic fans. 24th August, 1953. (749088.)

24273. British Thomson-Houston Co., Ltd.—Point contact transistors. 25th August, 1954. (749019.)

24701. Automatic Electric Laboratories, Inc.—Toll ticketing telephone systems. 7th September, 1953. (749171.)

26727. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Deflection systems for cathode-ray tubes. 29th September, 1953. (749024.)

26747. Farbenfabriken Bayer Akt.-Ges.—Apparatus for carrying out fusion electrolysis. 29th September, 1953. (749025.)

30668. British Thomson-Houston Co., Ltd.—Hermetically sealed barrier layer rectifiers. 2nd November, 1954. (749030.)

32069. Napier & Son, Ltd., D.—Electric spark generators. 12th November, 1954. (748923.)

32720. Western Electric Co., Inc.—Semiconductor electric signal translating devices and circuits employing them. 25th November, 1953. (748925.)

32761. Plessey Co., Ltd.—Electromechanical impedance conversion systems. 7th January, 1955. (749094.)

34121. British Insulated Callender's Cables, Ltd.—Means for helically lapping a string or similar member on a wire or equivalent member. 7th December, 1954. (749137.)

35316. General Electric Co., Ltd.—Manufacture of luminescent materials. 29th November, 1954. (748928.)

1954

1586. Western Electric Co., Inc.—Receivers for vestigial sideband signals. 19th January, 1954. (749038.)

2017. Beckman Instruments, Inc.—Electrode structure. 22nd January, 1954. (749143.)

3844. Skillman & Co. Pty., Ltd., T. S.—Manufacture of electric circuits. 9th February, 1954. (749172.)

4441. Soc. Per Azioni Fratelli Borletti.—Eddy current speed indicators. 15th February, 1954. (749043.)

16119. Morganite Resistors, Ltd.—Variable resistors and potentiometers. 31st May, 1954. (749161.)

16453. Philips Electrical Industries, Ltd.—Arrangements for scanning and reproducing magnetic fields. 3rd June, 1954. (749162.)

22059. Philips Electrical Industries, Ltd.—Transistor cascade amplifiers. 28th July, 1954. (749106.)

35551. Kelvin & Hughes, Ltd.—Electromechanical oscillator devices. 4th August, 1953. (748930.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 25th May:—

No. 738,761 (design). Class 9. Electrical apparatus and instruments; radio, television, sound reproducing, sound recording, receiving, transmitting and amplifying apparatus and instruments, etc. — Anorgana G.m.b.H., Gendorf (OBB)-Werk, Germany. Address for service, c/o Abel & Imray, Quality House, Quality Court, Chancery Lane, London, W.C.2.

FDS (design). No. 741,352. Class 9. Insulated electric conducting materials in the form of wire or strip.—F. D. Sims, Ltd., 12, Low Pavement, Nottingham.

PERMAFIBER. No. 744,375. PERMAGLASS. No. 748,163. Class 9. Electrical apparatus and instruments; signalling apparatus and instruments; industrial-chemical apparatus; laboratory apparatus and instruments and parts; and electric conduit material, conduit fittings, aerials and aerial masts, etc., all made of glass fibre bonded with synthetic resins.—Permali, Ltd., 125, Bristol Road, Gloucester.

ELLIOTTSYN. No. 749,224. ELTSYN. No. 749,226. Class 9. Electrical apparatus and instruments; and measuring, signalling and checking (supervision) apparatus and instruments.—Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.13.

TER-MATE. No. 749,380. Class 9. Fitted electrical terminal blocks and electrical connectors.—Electric Repairs (Nottingham), Ltd., Noel Works, Elson Street, New Basford, Nottingham.

VENUM. No. 749,831. Class 9. Electric soldering irons.—J. W. Emmerson and J. S. Wade, trading as E. & W. Electrical Services, 35A, Pickford Lane, Bexleyheath, Kent.

No. 748,092 (design). Class 11. Installations for lighting, steam generating, drying, refrigerating, ventilating, water supply and sanitary purposes; installations and apparatus for heating and cooking purposes; electric heating elements; hair drying appliances (not being machines); electric handlamps, hand lanterns, table lamps; domestic electric utensils; trolleys incorporating heating apparatus for keeping food warm; and electric pressure cookers and parts.—L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, Kingsway, London, W.C.2.

ARVIT. No. 747,565. Class 11. Lighting fittings and lighting installations and parts.—Simplex Electric Co., Ltd., Broadwell, Oldbury, near Birmingham.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Birmingham.—28th May. Corporation Parks Committee. Installation of electric lighting in two groups of greenhouses in Cannon Hill Park, 12. Sir Herbert J. Manzoni, city engineer, Civic Centre.

Burma.—16th May. Union Purchase Board. 191 fluorescent fittings. (E.S.B. 11280/56. Ten/19123.)*

Formosa.—24th May. Central Trust of China, Purchasing Department. Electrical and radio equipment including motors, generating sets, meters, switches, transformers, condensers, potentiometers, amplifiers, etc. (E.S.B. 11458/56. Ten/19190.)*

India.—28th May. Electrical Department, Corporation of Madras. Three electrically operated pumping sets. (E.S.B. 11588/56. Ten/19193.)*

29th May. Director General of Supplies and Disposals. Paper insulated cable. (E.S.B. 11207/56. Ten/19108.)* 31st May. Insulated copper wire. (E.S.B. 11243/56. Ten/19136.)*

Iraq.—1st June. Derbendi Khan Dam. Equipment including outlet conduits, power penstocks, gantry crane, elevator, generating units, switchboards, control and distribution panels, etc. (E.S.B. 11374/56. Ten/19156.)*

Northern Ireland.—23rd May. Electrical installation in new intermediate school, Larne. 24th May. Electrical installation in boys' intermediate school, Strabane. Varming & Mulcahy, consulting engineers, 37, Malone Road, Belfast.

Pakistan.—7th June. Karachi Port Trust. Electrification of the East wharves. (See this issue.)

Repton.—23rd May. R.D.C. Automatic and hand controlled electrically operated centrifugal pumping plant for Etwall pumping station. F. Bailey, clerk, The Poplars, Rolleston Road, Burton-on-Trent.

South Africa.—21st May. City of Johannesburg, Stores and Buying Branch. Two 400 kW rectifier sets. (E.S.B. 11303/56. Ten/19119.)*

25th May. Stores Department, South African Railways. Communication cable for Pretoria-Hercules Capital Park. (E.S.B. 11392/56. Ten/19154.)* Communication cable for Capital Park, Koedoespoort. (E.S.B. 11391/56. Ten/19146.)*

31st May. Union Tender and Supplies Board. Fluorescent lamps, conduit and fittings and electric cable. (E.S.B. 11448/56. Ten/19166.)*

Southend-on-Sea.—1st June. Borough Council. Electrical installation in Westborough Infants' School. (See this issue.)

Southern Rhodesia.—25th May. Posts and Telegraphs Department. 10,000 table model automatic telephones. (E.S.B. 11190/56. Ten/19157.)*

Taunton.—26th May. Borough Council. Street lighting equipment. (See this issue.)

Wallasey.—11th June. Town Council. Renewals of the electrical installation in the secondary modern school, Manor Road. Borough architect, Town Hall.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Municipal buildings in Broad Street (£700,000); burgh surveyor.

Ashington. — Additions to Ashington General Hospital for Newcastle Hospital Board (£127,000); Cackett, Burns Dick and Mackellar, architects, 21, Ellison Place, Newcastle-on-Tyne.

Banstead.—Extensions and rebuilding at Council Offices (£29,325); C. Carmichael, surveyor, Council House, Brighton Road.

Bath.—Domestic science training college; Holman & Davis, consulting engineers, 49, Park Street, Bristol.

Berwick-on-Tweed.—Houses (100), as first instalment of housing scheme at Spittal Hall; borough surveyor, Municipal Buildings, Wallace Green.

Billingham (Co. Durham).—Four-storey flats on the Roseberry Road estate; J. H. Shepherd, U.D.C. surveyor.

Bracknell.—Factory; A. G. Clark & Sons, Ltd., 1a, Bacchus Walk, London, N.1.

Brighton.—Primary school at St. Luke's Terrace; Jeffery & Sons (Hove), Ltd., 206, Portland Road, Hove.

Chester-le-Street—Houses (100), West Lane (£95,000); U.D.C. surveyor.

Chislehurst and Sidcup.—Houses (130), North Cray Place estate; W. B. Farrow, surveyor, Manor House, Sidcup, Kent.

Cobham (Surrey).—R.C. church; H. S. Goodhart-Rendel, architect, 22, Whitehall, London, S.W.1.

Crawley.—Factory; Redifon, Ltd., Carlton House, Regent Street, London, S.W.1.

Crewe.—Flats (90); borough engineer.

Darlington.—Houses (50), Springfield and Branksome estates; R. Blackett & Son, builders, Bondgate, Darlington.

Durham. -Modern school, Middleton-in-Teesdale (£70,000); F. Shepherd & Son, builders, York.

Eastbourne.—Flats (46), St. Phillips Avenue and Redoubt Road and houses (45), Langney Road, Lindfield Road, All Saints' Hospital grounds and St. Cyprians; R. Williams, borough surveyor, 2-4, Saffrons Road.

Eston.—Houses (50), Teesville estate; A. E. Gray and Son, builders, Chapel Street, Thornaby-on-Tees.

Falkirk.—Mechanised moulding shop; Grahamston Iron Co., Ltd., Gowan Avenue.

Gateshead.—Bungalows (74), Wickenton; borough surveyor.

Goldington.—County secondary school; county architect, Bedford.

Hayes.—Houses (41), The Warrens/Brookside Road site; East Acton Brick Works & Estates Co., Ltd., Brookside Brickworks.

Kent.—Grammar school for girls at Sittingbourne (£112,000) and technical school for girls at Sheppey (£75,000); E. T. Smith, Kent county architect, Springfield, Maidstone.

Leeds.—Three-storey block at Headingley (£120,000), for Wool Industries Research Association; Development Committee, Torridon, Leeds, 6.

Llanfyllin.—New council offices and chamber; surveyor, Rural Council Offices.

London.—Offices and works, Holborn and Fetter Lane; Daily Mirror Newspapers, Ltd., Geraldine House, Fetter Lane, E.C.4.

Extensions to Digby Stuart Training College, Roehampton Lane, Putney; L. H. Shattock, architect, 4, Crescent Road, S.W.20.

Flats (48), Harleyford Road, Kennington; Widnell & Trollope, surveyors, Broadway Court, S.W.1.

Additional wing, completion of west wing, and other alterations to the Polytechnic, Chelsea (£139,000); Munby and Smith, architects, 1a, Middle Temple Lane, E.C.4.

Maisonnettes (40), at Crescent Rise, Wood Green; A. Barnett, town clerk, Town Hall, N.22.

Mansfield.—Technical college (£292,869); county architect, County Hall, Trent Bridge, Nottingham.

Northallerton.—Schools at Osbaldkirk (£36,000), and Marton, Nunthorpe and Sleights (£22,900 each); county architect, County Hall.

Northolt.—Factory extensions; Tampax, Ltd., Belvue Road.

Northumberland. — County secondary schools at Tweedmouth (£136,000) and Morpeth (£239,000); C. C. Brown, county architect, County Hall, Newcastle-upon-Tyne.

Osbaldwick.—County primary school for North Riding E.C.; J. H. Napper, architect, Eldon Place, Newcastle-upon-Tyne.

Penzance.—Houses (150), on eight sites; borough surveyor, Municipal Buildings.

Peterborough.—Factory and offices, Fengate; Fortafix Liquid Cement Co., Ltd., Station Chambers, St. Leonards Street.

Peterlee.—Departmental stores in town centre; W. Woodbourne, company architect, F. W. Woolworth & Co., Ltd., 1, New Bond Street, London, W.1.

Pontypool.—Houses (300), during 1956-57; architect to U.D.C., Market Buildings, Crane Street.

Prudhoe.—Employment block and three villas at Prudhoe and Monkton Hospital for Newcastle Hospital Board (£124,000); John Jackson & Sons, contractors, Corporation Street, Newcastle-on-Tyne.

Radlett.—Junior modern school at Willow Way (£51,373); A. H. Aslin, county architect, County Hall, Hertford.

Reddish.—Two-storey extension to offices, Gorton Road; Reddish Chemical Co., Ltd., Globe Works.

Rochdale.—Out-patients' department at Rochdale Infirmary (£85,600), for Manchester Regional Hospital Board; architect to the Board, Cheetwood Road, Manchester, 8.

Sawbridgeworth.—Primary school in Bullfields Lane; C. H. Aslin, Herts county architect, County Hall, Hertford.

Shrewsbury.—T.A. centre in Sundorne Road (£200,000) for the Territorial and Auxiliary Forces Association; W. A. Harvey and H. G. Wicks, architects, 119, Hagley Road, Edgbaston, Birmingham, 16.

South Shields.—Houses and flats (51), Ravensworth Road; borough engineer.

Stockport.—Houses (88), Fairway; J. H. Smith (Hale), Ltd., High Lawn, Heald Road, Bowdon.

Sunderland.—Dwellings (202), Lawrence Street; borough architect.

Southmoor Secondary Technical School for the E.C. (£267,000); George Henderson, contractor, Boldon Lane, East Boldon.

Thornaby.—Three blocks of flats, George Street; borough engineer.

Tynemouth.—Three-storey flats at Chirton Green; borough engineer, 16, Northumberland Square, North Shields.

Uttoxeter.—Houses (24), Byrd's Lane; U.D.C. surveyor, Old Bank House Annexe, High Street.

Whitley Bay.—Houses (144), Seaton Sluice; L. Netts, architect, 69, Grosvenor Avenue, Newcastle-on-Tyne.